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REMARKS ON THE AGRICULTURE OF MASSACHUSETTS. BY ONE OF THE TRUSTEES.

[The ensuing remarks were written, at the suggestion of the Board of Trustees, by one of its members. The chief design of the writer and of the publication is to bring under the consideration of the farming interest, a systematic course of husbandry, founded on the principle of regularity in the rotation of their crops. The system proposed is that, which in the present state of the habits of the farmers of Massachusetts, seems to the writer to be the best. It is not intended, however, to support authoritatively any particular theory of cultivation, or rotation. But our object principally is to lead the way to thought and discussion of the subject by practical men, and to collect and diffuse the results of general experience upon it. For which purpose their observations are solicited, and will have respectful notice in this Repository.]

SEC. I. ON THE GENERAL STATE OF AGRICULTURE IN MASSACHUSETTS.

In considering the state of our agriculture, what first strikes the mind is the change, which time and circumstances are producing in the relations of our land and our industry. The population of Massachusetts Proper begins to feel the restriction, and to be affected by the laws of a limited territory. On an area of about six thousand square miles, we have, at this moment probably, a population of half a million;—or eighty to the square mile. A proportion a

little exceeding that of Scotland, estimated at seventy-five;—half that of France, estimated at one hundred and sixty; and one third that of England and the Netherlands, estimated at two hundred to the square mile. In a general survey our climate and soil may be considered of a medium character. With no intrinsic qualities, tending powerfully to deter, they have none strongly to attract settlement from other countries. Since the first ten years after the arrival of our ancestors, our state has comparatively gained nothing from the emigration of foreigners to it. On the contrary, it has, from that time, been a hive swarming for the benefit of other regions. The consequence has been, that, considering the actual basis of its population, its increase has been slow. Other states have been replenished by its vigour, while our own has augmented in a ratio so small, compared with the wonderful increase of other states, that it can be considered now, for half a century, scarcely more than stationary. The facility and cheapness, with which our population found that lands for settlement, in neighbouring states, might be obtained, have had a direct tendency to prevent the amelioration of our own. The sons of our farmers, with a few years of industry, could furnish themselves with means to purchase more land in the wilderness than their fathers owned, at a price, which made the purchase certainly valuable, and sufficiently near to their paternal residence to enable an occasional intercourse to be maintained between the sons and their family, during the first generation; and thus to render separation among relatives less painful.

It is plain, that, in this respect, the circumstances of Massachusetts Proper have undergone a change, which already has had great, and hereafter will have greater, effect on the condition of its agriculture. The circumstances, which heretofore tended to draw away our population into other states, are daily losing their force. The states, in our vicinity, are themselves becoming full. The

value of lands rise and bear a nearer proportion to the value of those in Massachusetts. The tide of emigration is attracted indeed by the circumstances of the land, far to the west. But the force of these attractions diminishes, in proportion to the distance at which it operates. They will probably never wholly cease, but must daily grow less efficient. Our population begins to increase in somewhat a greater ratio than formerly; and will probably hereafter continue to augment in a still greater. These new circumstances, in which our Commonwealth finds itself, are among the causes, which have occasioned that attention to agricultural pursuits, for which the present period is distinguished. Other causes of a more temporary and occasional character have co-operated in producing this effect; such are the embarrassments of our currency and the limitations of the field of commercial industry, resulting from a state of universal peace. But the most efficient and permanent are those, to which we have alluded, and arise from the fulness of our population, compared with the extent of our state; and from its now beginning to make itself practically perceived. What is true in Massachusetts, in this relation, is also true, in a greater or less degree, in every one of the old states of our union. Hence every where we perceive agricultural societies springing up; legislatures patronizing, intelligent men devoting themselves to the science, and an interest taken in its improvement, of a character more active and vigorous than this country ever before experienced. A new era in this art has apparently commenced. As it is the intention of the Trustees of the Massachusetts Agricultural Society, in the course of their publication, not only to communicate such particular facts, as experience and observation of practical men shall afford, but also to remark on the general state of agriculture, and to communicate such hints in relation to its amelioration as they deem most important either to be known or enforced, it has been thought that these general remarks on the state

of husbandry in Massachusetts would not be deemed irrelevant, and would be a natural introduction to some topics connected with the amelioration of our agriculture, which is the great purpose of our institution. In selecting these topics, we shall consider rather what is useful, than what is altogether novel. Certain leading topics must be treated, with greater or less repetition, in every successive number of our publication. The fundamental axioms of agriculture are not very numerous. But they are capable of an almost infinite variety of illustration. To make them understood, and show their applicability to the various species of soil in our country, and the different conditions of our husbandmen; so that a farmer with capital may not fear to enter upon their practice upon a considerable scale, and the farmer, with small capital, upon a scale conformable to his resources, is an important purpose of our society. In fulfilling this duty, we ought not to be deterred from placing the same topic in a great variety of lights, notwithstanding we may repeat some things, which before have been published, and may write many things, which are familiar to a great number. Our publications are intended to excite, as far as possible, universal attention to the subject of improving their agriculture among farmers. And this is better done by a persevering reiteration and illustration of old and known truths, than by a scrupulous research after novelties.

With these general impressions, we shall touch some topics, which we deem important for the farmers in Massachusetts, to consider, with more attention than they have been accustomed to bestow upon them.

SEC. 2. ON THE EXTENT OF LAND NECESSARY FOR A FARM, AND SUFFICIENT TO SUPPORT A FAMILY WELL, AND INDEPENDENTLY.

On this topic, perhaps the people of no country are so little practically instructed as ours. This arises from the

condition, in which the agricultural interest has been placed from the time of the first settlement of our country. Our ancestors found a wilderness, unoccupied except by savages. Those who fixed themselves in the country, when lands were cheap, naturally estimated their riches by the number, rather than by the productive power of their acres. Two, three, or four hundred acres were thought, at first, to be the extent of a location suitable for a farm. Afterwards, when, in the course of time, population became increased and lands divided, the ideas of farmers settled down to the opinion, that from eighty to one hundred and fifty acres, was about the number sufficient for an independent support of a family. Upon less than eighty acres, though a man might find ways and means to live, yet it was thought that he could hardly expect greatly to thrive. Accordingly the first effect of thriving among men of that size of farms, was generally evidenced by *the purchase of more land,* as the best criterion to themselves and assurance to their neighbours of their success in life. Often these purchases were made at the risk of embarrassment by debt, and almost always to the real injury of such farmers, whose surplus capital, or even their borrowed capital, would have been generally much better employed, in improving the lands they possessed, rather than in the purchase of more acres.

With respect to men possessing only thirty or forty acres, they scarcely ventured to call their possessions by the name of "a farm," so little is such an extent of land in general estimation, entitled to the use of that term. If they attempted to live and bring up a family upon them, they for the most part looked to other employment for their support. Turning mechanics, or hiring themselves out, at the most valuable season of the year, to their richer neighbours, or abandoning their own farms to tenants, and taking leases of farms, comprehending a greater extent of land, and so much better calculated to give that full employment to

their activity, which, to their mistaken apprehension, a farm of thirty or forty acres did not afford. Until of late years, opinions and conduct of this kind were almost universal. Even at this day, we know men, active, intelligent and industrious, possessed of this extent of land, who are labouring for others, or taking charge of their neighbours concerns, upon the avowed reason, that they cannot support their families upon thirty or forty acres! Yet their lands are good. The owners are industrious, intelligent, possessed of a strong desire of wealth and independence. But they do not realize the actual efficiency of the soil. Undoubtedly there are many honourable exceptions to the observation we are now about to make; as a general truth, however, it may be asserted, that THE FARMERS OF MASSACHUSETTS ARE YET TO LEARN THE IMMENSE PRODUCTIVE POWER OF A PERFECTLY CULTIVATED ACRE. Instead of seeking riches in augmenting the number of their acres, let them be sought in better modes of husbandry. As a general truth, we believe it may be asserted that every farmer in Massachusetts, possessed of one hundred acres of land, might divide them fairly, by quantity and quality, into thirds, and by a suitable cultivation, make either third more productive than his whole hundred acres are at present. This is the operation, at which those interested in the agriculture of Massachusetts, ought chiefly to aim—to make farmers realize what cultivation can effect, and to teach the modes, by which the productive power of the soil can best be elicited.

With respect to the productive power of a well cultivated acre, in addition to the many which have been stated in the former volumes of this publication, we shall cite the following, as placing the subject in as strong a light as is, perhaps, possible.

"The Androssan Farmer Society, in 1814, offered a silver medal for the best and heaviest crop of turnips in

the parish of Dundonald, situated in the west of Scotland; and appointed two judges to inspect the different fields, cultivated within the bounds. They proceeded in the execution of their duty, and in compliance with the requisitions of the Society, by weighing a square rod taken from the average of the fields in different parts. The result of their investigation was, that on one farm, a Scotch acre, which is short of an acre and quarter English measure, produced in turnips—

	Tons	cwt.	lbs.
Of bulbs, without leaves, - - -	76	0	0
Of leaves by themselves, - - -	14	0	0
Total - - - - - - -	90	0	0

Forty bushels of Turnips are about equal to a ton; and the quantity per acre, therefore, in bulbs alone, arise to the enormous amount of 3040 bushels, besides fourteen tons of leaves, of highly nutritive quality. Estimating the bulbs at thirty-three cents per bushel, *an acre will fetch upwards of one thousand dollars.* A sum sufficient to awaken the utmost agricultural industry. On another farm the same judges found

	Tons	cwt.	lbs.
The bulbs weighed, - - - - -	49	11	17
The leaves, - - - - - - -	17	5	51
Total, - - - - - - -	66	16	68

	Tons	cwt.	lbs.
On another they found that the bulbs weighed	48	7	16
The leaves, - - - - - - -	20	0	0
Total, - - - - - - -	68	7	16

As to the mode of cultivation nothing singular was stated. These quantities, though extraordinary, must not be supposed unprecedented; for throughout all England and Scotland, an intelligent Englishman asserts, crops of

similar bulk and weight could be selected in every parish and county."*

George Adams, in his Treatise entitled "The New System of Husbandry," developes his mode of managing an acre, which, according to his statements and calculations, is equal, in result, to raising food enough in one season, on one acre, to keep one cow 1089 days, which is three years, wanting only six days!! We shall not vouch for the actual experiment, to the extent stated. His mode, however, is unquestionably excellent, and the product must be great, even should it considerably fall short of the amount he asserts.

His mode is this:—

His cattle are kept in houses in winter and summer, so contrived as to save both dung and urine. He plants in the fall, or as early as possible in the spring, drumhead cabbages, in rows, three feet wide in the rows, two feet between the plants; that is, three plants in every square yard. Thus an acre will contain 14520 plants. If the land be poor the plants ought to be nearer. On good land in the English climate, they ought to weigh fifteen pounds each, upon an average, by the first of June. This is equal to 217,000 pounds, or one hundred and eight tons to the acre. He allows each beast thirteen cabbages and 1-4th or 200 lbs., for every day and night. The product of this acre, then, will keep twenty head of cattle fifty four days; or one head, one thousand and eighty-nine days—nearly three years.

Adams' system is connected with soiling cattle, or keeping them in houses during the whole summer, and is capable of still farther extension. For he states his practice to be carefully to cut off the cabbages by the head, leaving their stalks cut across at the top, to grow again.

* See the writings of Agricola in the Acadian Recorder, No. 18.

As soon as a few rows are cleared off, he spreads the dung and urine carefully over the ground. The cabbage stalk, being left, will soon sprout again. Then with a small hoe he cuts the ground over, so as to cover the manure, and sows turnips among the cabbage stalks. He continues to do this until the whole ground is gone over. He asserts that, in that climate, by the first of November he has as great a product, as at first.

In this way, land is improved by bearing crops, and one acre of land made to keep twenty horned cattle 108 days, or three and a half months ! !

Without vouching for the result of this experiment, in the extent here specified, it is simple and practicable enough to enable any one to satisfy himself of the greatness of its product, and must have a strong tendency to awaken the attention of practical farmers to the subject.

A question is sometimes asked, whether it be possible to obtain similar results, in Massachusetts. Our answer is, that to the extent such a result is attainable any where, it is attainable in Massachusetts. At least, there is nothing in the qualities of our soil, to prevent, and little difference in our climate, to make any material variance in result. Our intelligence and industry are not inferior to those of Europe. But the truth is, that we have not yet had our attention long enough directed to the subject, to become practically familiar with these modes of husbandry. Above all, our farmers being accustomed to disperse their attention over a great surface, and to attend to a variety of objects, and for the most part wanting the capital to be applied to high cultivation, or ignorant of the mode of applying it, either do not commence the cultivation, to which we refer, right, or do not prosecute it, for a series of years, systematically. Hitherto, there has been little intercourse of mind and interchange of experiments on agricultural subjects. This state of things is, however, now daily changing; and from the general attention paid to the subject, and

the intelligence engaged in it, there can be no doubt, that in a few years important effects will be produced on our agriculture.

In the mean time let small farmers in Massachusetts inquire. They will find that, in Europe, men possessed of thirty or forty acres of good arable land, are thought rich; that they often keep fifteen or twenty head of cattle; raise food proportionable to such an amount of stock; and support themselves and their families well and independently.

SEC. III. ON THE CULTIVATION OF ROOTS.

As a general principle, it may be asserted, we believe with truth, that the only basis of great success in agriculture, in a state of soil and condition of society, like that existing in Massachusetts, is *the field culture of roots*. Whether the vegetable selected be the turnip, or parsnip, or carrot, or cabbage, or potatoe, or any other of similar character, it perhaps is of little importance; but that one or other of them should enter into the regular rotation of our husbandry, is essential to its great prosperity. The want of this practice is the great defect of our agriculture. The practice of raising roots for family use, or for the market, is, indeed, common enough. But what is here meant, is the raising them for the consumption of stock, and as the principal dependence of the farmer for its winter support. This subject has frequently been discussed in former publications of this Society. It cannot, however, be pressed upon the consideration of our farmers too frequently, or too urgently.

The connexion of root cultivation with a prosperous agriculture is not a recent discovery, although it is the great boast of the farming interest of England and Scotland. More than fifty years ago, a Dutch farmer asserted to Joseph Marshall, an intelligent Englishman, at that time travelling through the northern kingdoms of Europe, for agricultural information, "that the foundation of all good agriculture was the raising roots, as the winter food for

cattle."* The reason is obvious. By this system the greatest quantity of food is raised upon the smallest extent of land, with the least labour. What other cultivation can enable a farmer to raise fifty, sixty, and even one hundred tons of food, of an excellent quality, upon a single acre? There is none, in point of product, that can pretend to compare with it. In a country and in a state of population, like that in Massachusetts, the importance of this system cannot be too highly estimated. Owing to the state of our population, lands, compared with their quality, are high. Farmers must learn, in such a country, to do with little land. That cultivation ought, therefore, to prevail, which enables them to produce the greatest quantities of food on the least extent of soil. Again, the lands in Massachusetts, considered in the aggregate, cannot be estimated at more than of a medium character, in point of fertility. What do farmers on such lands require? Manures. How are these to be obtained in the interior of such a country; and the greater number of farmers are always in the interior? There can be but one answer to this question. By cattle. I say nothing of plaster of Paris. The use of this mineral forms an anomaly in the principles of agriculture, and where its utility is ascertained, may be made the basis of a system of agriculture altogether peculiar. But, generally speaking, a rich agricultural country must be a cattle raising country. Now a country, which is, in a manner, winter seven months in the year, can by no possibility become a great cattle raising country, unless it make great provision for their support during the rigours of that season. This can alone be done, upon a great scale, by roots. By appropriating a few acres of his best lands to their cultivation, the Massachusetts farmer will be enabled to increase in a proportionate degree his stock of cattle. Instead of understocking his pasture ground, as is the case in most parts of the country, through fear of not being able to

* See Travels through the Northern kingdoms. By Joseph Marshall, in 1768, 1769, and 1770. Vol. I. p. 214.

maintain his summer stock on his winter food, this system enables the farmer to stock his pastures up to their full power. He has only to calculate what number of cattle his pastures can keep well during the summer, and raise such a quantity of roots, as, with his hay, will keep such number of cattle through the winter. This system is capable of much greater development. But, in its first attempts, it can most safely be limited to the purpose we have named, that of enabling the farmer to stock his lands up to their full pasture power. After practice has made him familiar with the system, it will be succeeded by the easiest and most economical of all modes of raising cattle, that of soiling them, as it is technically called; or keeping them under roofs all the year round, and feeding them, during the summer months, with green vegetable substances, cut and delivered to them daily. The Trustees of the Massachusetts Agricultural Society have taken some steps towards obtaining an experiment upon this system, on a scale sufficiently extensive to make its utility apparent, should such be the result; and also calculated to illustrate the mode of performing it, in the climate and on the soil of Massachusetts. This they expect to be able to communicate in some future number. In the present state of knowledge and experiment, it is not contemplated to recommend to farmers a system so novel, and apparently so dubious, as that of soiling. It is only meant here to suggest, that a high state of agriculture must probably eventuate in the adoption of it; at least, on very many farms in Massachusetts. The system of raising roots by field culture, for the purpose of the winter food of stock, is independent of that soiling, and solely dependent upon the fact, that in this way, a very great, perhaps the greatest possible quantity of food, can be raised with little comparative labour, on a very small extent of land; and that food for the support of stock, in winter, is essential to the success of any extensive plan of husbandry, in such a climate as that of Massachusetts.

SEC. IV. ON THE ROOTS BEST SUITED FOR FIELD CULTURE.

Considering root cultivation as the best basis, on which to place the hopes of a prosperous agriculture in Massachusetts, our next remarks naturally are directed to the vegetable, which ought to be selected for this purpose. The practice of farmers, in other countries, has terminated in the preference of either the carrot, the turnip, or the potatoe. Other vegetables, such as the parsnip, the beet, and the cabbage, have had the approbation of particular individual agriculturalists. But we apprehend, that the three first are favoured by the greater number of farmers. Of these, the turnip has, in other countries, been most generally approved, and the benefits of the potatoe most frequently been controverted. It is not our intention to enter into the discussion of the merits of either. As far as our experience extends, each will amply reward the industry and skill of the cultivator; and there are reasons why all should be cultivated in some proportions, on every farm, conducted on the basis we recommend. The quality of his soil ought perhaps to decide each individual in making his selection. Every thing else being equal, we consider that bushel for bushel, the carrot is superior as a winter food for cattle to the potatoe; and perhaps the Swedish turnip is superior to either. This we know is controverted by some, and the degree and ground of preference have been made the subject of distinct experiments, with various results. Our Massachusetts modes of agriculture in relation to both may be improved. But according to our experience, a greater quantity of either carrots, or turnips, than of potatoes, may be raised on the same ground, for equal labour. That is to say, four or five hundred bushels of either may be raised at an expense of labour and land, which would not raise two hundred bushels of potatoes. This depends, however, upon the manner, in which those crops are managed. Both may be made costly crops,

unless the mode of field management be well understood; and when this is the case, they can scarcely fail to be very profitable. The sort of comparison, which has been instituted in relation to the different values, as a productive food, of these three vegetables, is, however, in our opinion, a matter rather curious than useful; inasmuch as each ought to enter into any extensive scheme of agriculture, having for its basis the cultivation of roots. . The reason is, that this system requires a regular rotation of crops; that is, that one crop should successively follow the other: so that, at the end of a certain number of years, after the determined series shall have been gone through, the same crops return in relation to each other, in the same order. A right rotation of crops being then an essential part of that system of agriculture which we advocate, we shall recur very shortly to this topic.

SEC. V. ON A ROTATION OF CROPS BEST SUITED TO A SYSTEMATIC AGRICULTURE, HAVING FOR ITS BASIS THE FIELD CULTURE OF ROOTS.

In treating this topic, we shall not trouble ourselves with discussing what is abstractedly the best, in all times, or in all places. Our business is to elucidate what is best suited to the agriculture of Massachusetts. And in determining this, great respect ought to be had to the prevailing customs of its husbandry, and the existing state of knowledge among the mass of the farmers of the state. We think, therefore, that the system of rotation to be recommended ought to be simple, and, as far as possible, conformable to the present practices of our farmers; at least in every thing, not contravening the essential principles of the system we advocate. Let us suppose, then, that a farmer's land is in the sward, and that it is proposed to put his farm into a course of management for the raising vegetables, for the consumption of his stock; the question is, what rotation shall be adopted? To this we answer, that if, from any

circumstance of convenience or calculation, such farmer prefers to commence his rotation of crops with any species of roots, none is preferable to the potatoe. This therefore ought to precede, in our opinion, all others, not only because, as far as we have had any experience, it is the best of all breaking up crops, as they are called, but also because the farmers of Massachusetts are so well acquainted with its nature and management. The reason why the potatoe ought to lead in the series of root cultivation, is, that it is productive with manures when they are in a crude and strawy state; that, when properly cultivated, it deepens and pulverizes the soil, and leaves it clean and friable. It is, therefore, an admirable preparative for other vegetables, particularly for the carrot and turnip. It will be observed, that we have recommended the potatoe to lead in the rotation, only conditionally. The reason is, that we are satisfied that the common practice of making the potatoe a breaking up crop, is not the most advisable. It appears to us best, all things considered, that the first crop after turning over the sward, should be oats; sown at the rate of four or five bushels to the acre, well harrowed and rolled, and cut in the milk for fodder. That this is a productive process, is familiar to our farmers: it being a common practice, we believe, in all parts of the state; it certainly is in the vicinity of our capital, with some of the best practical husbandmen. It is certain that this cultivation pays for rent and labour. The reason, why we think it ought to be the first step in all rotations, in Massachusetts, is, that its tendency is to enable the subsequent cultivations to produce their best effect upon the general condition of the soil; a circumstance not sufficiently considered by the Massachusetts farmer; who is too apt to have an exclusive eye to the product of the present year, without regarding sufficiently the effect upon the general state of his land. We think, therefore, that oats sown for fodder, on the inverted sward, should be the first step in a

good rotation. And we should be of this opinion, even could it be shewn, which we think it cannot, that the product of the potatoe would be greater, first after turning the sward, than when it follows the oat crop. The reverse we know to be the case. We make, however, this observation, because we know practical farmers, who have a contrary belief, and who think that both the potatoe and Indian corn produce more after the first turning of the sward, than when following any other crop whatever. This opinion, might, we think, be easily shown to have its origin in a defective course of agriculture. We may make some remarks on this subject hereafter. It is at present sufficient for our purpose to notice it in passing. The reason, why an oat crop should precede the potatoe crop in the rotation we recommend, is, that it not only pays well by its product for the year's labour, but chiefly because it enables the husbandman to deepen his ploughing, preparatory to the second year's series in the rotation; that is, to the potatoe crop. Every facility ought to be given to the Massachusetts husbandman, to encourage and enable him to plough deep, whatever be the soil. We will not say there is no exception to this rule. But we believe it is as true as is any general proposition. One of the great defects of the Massachusetts agriculture is, the inclination among farmers to shallow ploughing. A contrary opinion begins to gain ground among the most judicious. But, with many, four or five inches depth is still thought sufficient. They deem it a great evil "to turn up the red earth." It is not our intention to give the reasons, which favour deep ploughing. They are so numerous, are so universally stated by all writers, are so consonant to reason, and begin so generally to be understood, that we do not think it necessary to make any statement on the subject. We take it for granted, on the present occasion, as a settled and acknowledged principle of agriculture, that the deeper the tilth the better the husbandry, and of con-

sequence the more productive. We think, however, it is important to make some remarks on the manner, in which this depth of soil is to be attained; and the more, because we know some who have committed great errors, and young beginners particularly are apt to fall into an injurious course of ploughing in this respect. We knew a gentleman of this class, who, being convinced of the importance of deep ploughing, and desirous at once to realize the advantage of it, adopted this course; certainly a very natural one. He began his farming by breaking up his sward land, with three yoke of cattle and a Dutch plough, running a furrow eleven or twelve inches in depth, and as wide as deep. The consequence was, all the "red" or unproductive earth, was on the top, and all the good soil at the bottom. He planted his potatoes with the usual quantity of manure, and in the usual manner. His product however was indifferent; and after a great expense he was astonished in autumn, that after such deep ploughing his crop was not very superior. The reason undoubtedly was, that the red or unproductive earth bore too great a proportion in the whole ploughed soil; it was turned over in too great masses; and although the general state of the soil was unquestionably ameliorated by the operation, yet he made too great a sacrifice for this general good, in the smallness of the first year's crop, in comparison with the cultivation. The great study of our farmers ought to be to deepen their soil, but this ought always to be effected gradually, and without a sacrifice of any one year's productiveness. This can be done only by a judicious rotation. And it is with this reference, that we are of opinion that oats sown and cut for fodder, are best made the first link in a judicious system of rotation.

The first ploughing of sward land should always be as shallow as is consistent with turning the sod over well. And this for two reasons. 1. Because the thinner the furrow slice, the nearer the harrow is brought in contact

with the roots of the inverted grass, of course it does its work of destroying them more perfectly. 2d. Because the work is done with a less force of team, than when a greater depth is attempted in breaking up sward land.

The rotation, then, which, with reference to the general state of agriculture in Massachusetts, is deemed best, is a six years' rotation.

1st year. After breaking up the sward is oats sown, thick, to be cut for fodder.

2d year. Potatoes or Indian corn, or both.

3d year. Carrots or turnips, or both.

4th year. Barley or wheat, sown with clover and herds' grass, or red top.

5th year. Clover mowed.

6th year. Herds'-grass and clover.

In the autumn of the sixth year, the land to be broken up, and on the seventh year the same rotation recommences.

We prefer this course and limitation of rotations, for our Massachusetts agriculture, to any other.

1. Because it varies so little from the present course of our general husbandry. The only important differences consist in three particulars;—in making oats, cut for fodder, invariably to precede potatoes or Indian corn; in making these to be invariably succeeded by carrots or turnips; and in ploughing up the land invariably at the end of the sixth year.

2d. Because it makes deep ploughing easy, by facilitating the plough on the second year, by the effect of the oat crop upon the soil; for not only the texture of the grass-roots is destroyed by the ploughing for the oat-crop, but the tendency of the oat is to pulverize the soil by the expansion of its roots while growing, perhaps more than any other grain.

3d. Because an adherence to the specified rotation, requires that our farmers should plough up their land, at

least once in six years, instead of the uncertain method usually prevalent, in which little or no regularity is adopted. Each piece is broken up in turn, as temporary expediency dictates, in which every thing is sacrificed to the passing year's expectation of product. Whereas a systematic agriculture proceeds upon the principle of a gradual amelioration of the whole farm, by a systematic course of cultivation. Thus making every acre, if possible, equally productive, instead of exhausting by a course of constant cropping, a few favourite pieces. In other words, the effect of regular rotation in husbandry is to improve the worst acres, and to favour, by not annually exhausting, the best. Whereas the effect of an irregular course of husbandry, dependant upon the exercise of the annual judgment, or caprice of the farmer, is precisely the reverse; to deteriorate the best parts of a farm, and not to improve the worst.

We shall farther attempt to illustrate the benefit of such rotation, by remarking upon each year's annual crop, in the proposed succession.

SEC. VI. OF THE FIRST YEAR IN THE ROTATION—OATS SOWN FOR FODDER.

This cultivation we recommend for the reasons before stated, and also because no grain thrives better on an inverted sward than the oat, or less exhausts the soil. Those, however, who prefer to commence a rotation of crops, by the potatoe, thereby reducing it to a succession of five, instead of six years, may do it without affecting essentially the advantage of the system. However, the benefits resulting from commencing the first with oats, rather than with the potatoe, deserves a little farther illustration.

The great object which a farmer, entering upon a systematic course of husbandry, should contemplate as essential to its success, is *the manuring well*, once in six years,

all the land he subjects to rotation. Now, in manuring well, three things are included:—the manuring sufficiently; the manuring equally; the manuring deeply. If the rotation commence with the potatoe, and this be put into the ground the first year after the sward is inverted, it is next to impossible to put the manure into the ground so deep and so equally as it can be, when, in consequence of the oat-crop, the land is submitted to the plough, free of sod, and the cohesion of sward thus dissolved. In putting manure upon land for potatoes, first after the inverted sward, the manure is always put near the surface. It cannot be covered with the plough, in the usual rough way of planting the potatoe; and the consequence is, that for covering the potatoe and the manure, the hoe is almost wholly depended upon, and the work is done by scraping the earth, and heaping it up in hills. Of all modes this is the most expensive, and the least beneficial to the land. What the farmer wants, in order to attain a great product, is to make a great and a deep bed, for the roots of his crop to shoot and expand. Now, hoeing is in fact little better than scratching the land, compared with the great surface moved by a plough when it runs, unobstructed by the sward. To enable the plough to do its work well, when preparing for potatoes, we therefore deem that oats ought to precede them. Why it is so will be apparent, when, in our next section, we treat of the potatoe cultivation.

With respect to the oat we prefer it should be cut in the milk, as it is called, to be used for fodder, than to let it ripen for grain. By cutting in the milk, the land is not exhausted by the plant, since it is found that in forming the seed of plants, the greatest exhaustion of the ground is occasioned. However, if the farmer choose to ripen his oats, this circumstance is of no material importance, in relation to the system of rotation. We think it generally best, and, in the vicinity of the capital of Massachusetts, it is certainly more profitable to cut in the milk.

SEC. VII. OF THE SECOND YEAR IN THE ROTATION—THE POTATOE OR INDIAN CORN.

In a system of regular rotation, the second year may be devoted to potatoes or Indian corn. We mention the last, not because we deem it, as usually managed, a profitable cultivation, but because no system is likely to be easily made popular in Massachusetts, from which Indian corn is absolutely excluded, or in which a place is not provided for it. It may be substituted for potatoes; or, the land subject to the rotation of the second year, may be divided between them. They each bear a relation to both the antecedent and subsequent crops in the proposed rotation, not very dissimilar; both follow oats, and precede carrots, well and profitably; both ought to be managed, so far as respects the soil, in the same manner; and both leave the soil, as it respects tilth, in a state not very dissimilar. So far, however, as the exhaustion of the land is a circumstance of weight, the general opinion is undoubtedly true, that the potatoe exhausts much less, and its cultivation ameliorates the soil much more, than Indian corn. And for this reason we give it the preference, in the system of rotation.

With respect to the cultivation of the potatoe, it may be thought presumption to pretend to suggest any thing new to the Massachusetts farmer, upon the subject. If, however, they would reap the full benefit from a rotation of crops, which the system proposes, they must, in some respects, change the mode most generally in use. We refer to the practice almost universal, of cultivating the potatoe in hills, with the hoe—and with a quantity of manure, adapted merely to the imagined exigency of a medium crop.

In these three respects the common practice ought to be abandoned. We shall not meddle with the question, whether more potatoes can be raised in hills, or in rows.

Although we have no doubt the last method is by far the most productive, could the reverse be proved, which, satisfactorily, it cannot, a very considerable benefit in the crop, in favour of the hill culture, would scarcely be sufficient to balance the other disadvantages of the practice.

By cultivating in hills, the manure is deposited in spots, all over the ground; and of course, far less equally distributed than when deposited in rows. But the great objection to the system of the culture of potatoes, in hills, is, that it almost makes unavoidable the use of the hoe—an instrument, which is in every country expensive where man's labour is high, and of course most expensive of all, in a country where it is higher than in any other. By the row-culture the use of the hoe may be almost, if not altogether, excluded. And this circumstance gives it a decided preference.

The culture of potatoes in rows, almost necessarily leads to the use of more manure than is practised in the hill culture; indeed this is inevitable, if the rows be, as we think they ought to be, not more than two feet and a half from each other. A circumstance, beyond all others, beneficial.

We know that a contrary practice is advocated by some distinguished experimental farmers, who say that at three and even four feet, by reason of the facility with which the crop is, in its after culture, ploughed and weeded, a greater product may be attained. This is possible, although we think not likely, but if it were, the reason, just given, in relation to the preference of the row culture over the hill culture of potatoes, is equally conclusive. The great object of the farmer ought not to be, abstractedly, to raise the greatest crop possible in a single year; but to raise the greatest crop possible consistent with the highest amelioration of the soil. The same reason is as strong against cultivation of the potatoe, in wide rows, as in hills; the manure is placed at too great a distance, and it is scarcely practicable, by any general after ploughing, to spread it

equally over the surface; the succeeding crop comes up in bunches, or in rows. Whereas, when the rows are only two feet and a half from each other, an autumn cross ploughing, followed by a general spring ploughing and harrowing the ensuing year, preparatory to the carrot cultivation, equalizes all the manure; and leaves it spread the most beneficially, not only for the carrot crop, but which is more important than all, for the three years destined to barley, clover, and herds'-grass. If any one prefer, however, rows at the distance of three feet, he can adopt it without any material disadvantage to the success of the general system.

It will be expected, and it is proper that something should be said on the mode of potatoe cultivation, which we deem most to be preferred. If, to many, there be nothing new in the suggestions we shall make, let it be remembered, that we did not propose to ourselves to collect novelties, but to press useful truths upon the general attention of farmers.

Supposing, then, that oats cut in the milk have preceded the potatoe, as we have suggested, good husbandry requires that the oat stubble should be turned under by a general ploughing of the whole, as soon as possible after the oats are taken from the land. This ploughing is very likely to be neglected or postponed, owing to the many calls on the farmers attention, at the time of the oat fodder harvest. Yet it is very important that this ploughing should be performed as early as possible. Not only because of the general advantage to the ground, resulting from all ploughing, but also from the longer time thus given for the roots of the oat to decay, and so become manure; and above all, from the destruction of weeds, and preventing them from filling the ground with seeds. The neglect or delay of autumn ploughings is a great defect in the general husbandry of Massachusetts. In good farming, the attention to the destruction of weeds, preparatory to sowing the crop, is quite as useful as subsequent to it. The one will some-

times render the other unnecessary, and always greatly diminishes the labour and expense of that operation. If after this summer's ploughing, other business of the farm will permit, it is an excellent practice to throw the whole into ridges, by furrowing and back-furrowing alternately, or, which is better, with a double mould plough. In this way, the surface is exposed to the action of the frost; and the great process of husbandry, deepening and pulverizing the soil, carried on cheaply and efficaciously.

In this state, the land should lie until the spring, when the ridges should be split, and the land harrowed level. A deep and general ploughing should then be given, and the land again harrowed level. At this spring ploughing of the second year of the rotation, is the time for commencing the deepening of the soil. By the ploughings for the oat crop, and the subsequent autumn ploughing and ridging, the upper stratum will have been well pulverized, and all the texture of the grass roots broken. The plough has now got the second stratum at advantage. The first stratum may be considered as four inches. The second stratum as four inches more. This spring, ploughing of the second year of rotation ought, therefore, to be at least eight inches. Deeper would be advantageous. But in a systematic culture, this is sufficient:—1st. Because the carrot cultivation, in the third year, is calculated to finish the whole depth of the necessary ploughing, by deepening the bed to twelve inches. 2d. Because, although a greater depth than eight inches would be desirable, even for potatoes, yet a greater depth than eight inches, in the generality of our land, cannot be penetrated, at the commencement of such a system, by a force of team not exceeding one yoke of oxen. And as it is one object of systematic culture to diminish the expense of ploughing, we shall show, in the course of these remarks, that on a farm subjected to the rotation system, no force of team ought to be used, after one rotation is completed, greater than one yoke of oxen and one driver, for any ploughing.

We suppose, then, the first spring ploughing for the second year of rotation (the year for potatoes) completed, to the depth of eight inches, and the whole well harrowed level. The next step in the process is with a double mould board plough, to open the furrows, at a distance from each other, of either two feet and a half or three; at the election of the farmer. If he have no double mould board plough, then the common plough will produce the same effect, less conveniently, however, by furrowing and back furrowing. However, a double mould plough is so useful an instrument, that it cannot be too highly recommended. The English and Scotch ploughs of this kind are made with sheet iron mould boards, and with hinges and hooks, so as that the trench opened by the plough may be made wider, or narrower, at the pleasure of the workman. These ploughs are easily to be obtained from England, Scotland, or New York. They are of such great use, that it would be well worth the exertion of two or three farmers, in every vicinity, to join and procure one, in common. Their cost does not greatly exceed that of a good common plough. There is no particular skill requisite in the use of this plough. It ought only always to be remembered, that its purpose is not to deepen the soil, but to open a trench in it to the depth already attained by the previous ploughings. Below which, this plough is not intended to reach.

The land being thus thrown into furrows at two and a half, or at most, three feet distance, the next step in the process is the carting out, and distributing the manure.

In doing this it must be remembered, that the carts ought to enter at the end of the furrows, so that the ridges should not be beaten down by the wheels, or by the oxen crossing over them. And for this purpose, the preceding process of throwing the land into furrows must not be done all at once; but after three, or, at most, five furrows are made, the manure is to be carted and spread in the furrows, as above directed; being careful to fill the trenches

sufficiently, and that all the manure is below the level of the ridges. As soon as these three, or five furrows are sufficiently filled with manure, the potatoes, if they are cut, ought to be dropped at eight inches distance. If they are whole, then at twelve inches distance. The potatoes are thus placed on the top of the manure. But it will be best if the dropper presses each piece, or potatoe a little into the manure, with his hand or his heel. After these three, or five rows are thus planted, and manured, the ridges are split by the double mould board plough, and the potatoe and manure are thus completely and sufficiently covered, without the use of the hoe. This finishes the process of planting the potatoe. After the three, or five first rows are completed, three or five more furrows are to be opened and treated in the same manner, until the whole piece is finished.

To the performing this part of the process well and most economically, two or three things must be attended to:—1st. It is a great saving of time and labour, if the manure shall have been previously, (say in the winter season,) carted upon the land. The location of the manure heap is also a subject of some attention. It must not be in the centre of the land, but, at the end of the place destined for the termination of the furrows, or drills. So that the carts, when going from the heap, shall always enter into the ends of the drills. It being important in this husbandry, that the carts should cross the ridges as little as possible. 2d. The potatoes ought to be cut, also, in the winter season, and kept, one or two months, in heaps in the cellar. The work is thus done, at leisure, and the best potatoes selected for seed. It is thought also, by practical farmers, that it is best that the wound produced by cutting the potatoe, should be dried by laying some time in the cellar, previously to its being put into the ground. At any rate it is no disadvantage; and cutting potatoes is good work for stormy and winter weather.

We have said, that the proximity of the drills or furrows, in the culture, was "beyond all other circumstances beneficial, from its rendering unavoidable the use of more manure than is commonly applied." The custom of manuring a great deal of land very slightly, instead of a much smaller quantity very well, is the great error of Massachusetts farming, and is probably the reason of the difference between our crops and those common in the well cultivated parts of Europe. Ten or fifteen loads of common barn manure is thought to be sufficient for an acre. Whereas there ought never to be less than thirty loads, and good cultivation is scarcely satisfied with less than forty to the acre.

The generality of Massachusetts farmers will, we know, think that even thirty loads to the acre is enormous. But let them remember, that the system we recommend requires only that one sixth part of the arable land should be manured every six years; and that the manuring now given, is to serve for the potatoe, the carrot, the barley, the clover, and the herds'-grass crop. Whatever is worth doing at all, is worth doing well. It is better to put a few acres in a state of high tilth and improvement, than to put a great many in a state only a little better than deterioration.

In relation to the after culture, some very important processes ought to be attended to, which are generally altogether neglected by the Massachusetts farmers. The land having been thrown into ridges, two and a half feet distance from each other, and about one foot high; under which ridges, the manure and the seed for the ensuing crops of potatoes having been deposited; in this state they should be allowed to remain, for ten or twelve days, that is *until just before the potatoes begin to shoot above the ground.* They are, from time to time, to be examined to see when they have risen to a few inches below the surface. At this time, before they are out of the ground, the harrow should be

passed over the ridges lengthways; or if it be feared, that the length of the harrow teeth should injure the new shoots, then the ridges may be harrowed flat with the back of the harrow. The object is to kill the weeds, which have grown, or began to root themselves, since the planting. The potatoes will now come up on a clean bed. As soon as they appear, and the line of the crop is distinctly to be seen, a double mould plough, or, if this be wanting, a single one, should be run through the furrows, throwing the earth to the crop. This in land, in which weeds are not luxuriant, is often sufficient. If, however, weeds appear among the shoots in the rows, the hoe may be used lightly, for the purpose of eradicating them, and evening the tops of the rows. If, however, as the plants advance, the judgment of the farmer deem it best, it will be advantageous to give the plants a second earthing up, which will complete the work.

A farmer may reasonably calculate, after a planting of potatoes thus managed, averaging one year with another, at least two hundred bushels to the acre; and if general circumstances favour, three hundred; possibly a much greater quantity.

Much indeed will depend upon the general state of the land and the season. But the greatness of this average, compared with the usual average product of an acre of potatoes in Massachusetts, depends upon the greater quantity of seed, and the greater quantity of manure, which, to this course of husbandry is indispensable. Where the rows are only two and a half feet from each other, it takes not less than twenty-five bushels of seed. When they are at three feet distance, somewhat more than twenty. As to manure, from thirty to forty load, is the least that ought to be permitted. For on this system of rotation, the products of five years, including the year of potatoes, depends upon the heart, into which the land is put in this, the second year. By "loads," we here understand buck loads, as they are called in the

vicinity of Boston. That is, as much as one yoke of oxen can well draw on ploughed land.

A few words will suffice on the mode of harvesting the potatoe crop. The common mode of taking them up with the hoe is expensive. That of leaving the tops upon the ground slovenly ; and where the intention is, that a carrot crop should follow, is apt to be injurious. Because the carrot, in its first stages of growth, is an extremely small and delicate plant. And if the potatoe tops of the preceding year be left on the ground, all those fibres which have not decayed, are apt, in the course of the hoeing and ploughing the carrot, to clog the instrument, and thus draw out a part of the carrot plants. Now it is a principle of the rotation system, indeed of all good farming, that the mode of managing the crop of each year, should not only be best for that crop, but also best for all that succeeds. In harvesting the potatoe, therefore, reference ought to be had to the carrot crop, which is to succeed. For this purpose the first process of harvesting the potatoe crop, ought to be, pulling the vines; and after taking off the potatoes, which adhere, throwing the vines into a cart, to be passed down the rows, carrying them off to the barn yard and hog pens. This mode is recommended as the first step, because, as the mode of uncovering the potatoe is by the plough ; if the vines be not previously taken off the ground, a great part will be buried, or get intermixed with the soil, and the parts which do not decay will certainly interfere with the succeeding crop. This process concluded, a double mould board plough should be passed through the centre of the ridge, at the depth of the potatoe bed. The great mass of the potatoes will be found in the furrow, or be seen on the edge of each side of it. Not a hoe should be permitted on the field. The pickers should follow the plough, throwing the potatoes into baskets and thence into carts. As soon as the furrows are cleared of the potatoes, which are exposed to the eye, a harrow

should be passed also lengthways the furrow. This disengages the residue. The pickers again follow. Very few, if any, will remain after these two processes. If any should, they will be all easily gathered by a boy passing over the field, and following the plough when the land is thrown into ridges, which is the last process in the autumn of the potatoe year; that is, of the second year in the rotation.

The potatoe crop being harvested, it is now the time to give the land its last deepening, by a general ploughing, going to the depth of eleven or twelve inches. This is now done easily, the potatoe cultivation, and particularly the ploughing and harrowing accompanying the harvesting the potatoes, having brought the land to a state to be easily penetrated by the plough, with one yoke of oxen, to the desired depth.

After this general ploughing, the land should be thrown into ridges, as high as possible. This again exposes the land to the action of the winter's frost, the advantages of which have before been intimated. Thus finishes the labours of the potatoe year, or the second in the proposed rotation.

SEC. VIII. OF THE THIRD YEAR IN THE ROTATION— THE CARROT AND THE SWEDISH TURNIP YEAR.

In good farming, and on the proposed rotation, both these vegetables ought to occupy the third year. That is, both ought to be cultivated in such proportions as each farmer shall judge best. But, with one or the other, or with both, the land subjected to the rotation ought to be filled. The reason is, that they are unquestionably as valuable as any roots. The cultivation of each coincides with that of the other. If rightly managed, neither the sowing nor the culture of either, will interfere with that of the other. In their expenditure, also, the carrot is most excellent as a food in the winter, and the Swedish turnip, in the spring

and early summer. The farmer ought, therefore, systematically to provide himself with a store of both, so that his cattle may not want succulent food until the grass returns.

The land, subjected to the rotation has been, by the cultivation of the first and second years, brought into a condition the best possible for both species of roots. It is pulverized, it is weeded, it is deepened in soil, it is enriched. The labour of the third year is, also, greatly lessened and facilitated. Its course is as follows:

As early as possible, after the frost is out of the land, and after it is sufficiently dry for cultivation, let the ridges be split, and the land harrowed level. A general ploughing should then be given to it. The part destined for carrots should now be thrown into ridges, at about two feet distance from each other, in the manner before stated in the last section. The rows may be nearer, even to the distance of twelve or fourteen inches. But in the commencement of this cultivation, by any farmer, it is best to take land enough between the rows. For when a farmer first commences this culture, upon a considerable scale in the field, he is apt to be alarmed at the labour of hoeing and weeding such an extent of vegetables, and to be deterred from prosecuting it. Unless, therefore, he does every thing to facilitate the operation of weeding in the first year of the attempt, the hand labour upon the crop is apt to be so excessive, as to lead him to throw up the cultivation in despair. Whereas, if he perseveres, after a little experience, he will find it but little, if any, more expensive than that of Indian corn; and the profit five times as great.

After the ridges are finished, a man with a light rake smooths the top of each ridge, so as to make it three or four inches wide. On this the seed is sown, either by the hand or the drill machine. The former is the most certain; the last the most economical and expeditious. In the commencement of this cultivation, the farmer ought to use the latter. It is easy to be procured, and cheap

and every facility ought to be provided to diminish the labour of the cultivation, which almost every farmer, at the commencement of it, deems excessive. The great difficulty of drill machines, is, that they are often liable to get clogged, and sometimes miscarry. Besides, it is next to impossible to prevent their sowing the seed too thick—a circumstance, which is almost always the cause of a deficiency in this crop. For, although it would seem easy enough to cut all surplus plants out by the hoe, in either weeding, yet it is found by experience very difficult. One carrot ought not to be nearer than three inches of the other, in order to obtain a great crop, which always depends more upon the size of the plants, than on their number. To cut them out at this distance, when they are sown too thick, is an affair of some labour and care. When young, the carrot is so small, that the labourers never fail to spare too many; partly through indolence, and partly because when thinned to the degree they ought to be, at this period of their growth, the appearance of the crop is diminutive, and apparently unpromising. If a farmer can counteract this propensity to spare the plants, a drill machine will greatly serve his crop. However, some agriculturalists strongly incline to the opinion, that it will pay well, by the facility which is thereby given to the after culture, to put the seeds in by a dibble; that is, making holes at the proper depth and distance, with a pointed stick, and depositing the seed by hand in them; afterwards rolling the land. This, however, we shall not recommend; the other is so much more expeditious, and the crop sufficiently productive. After the seed is deposited, it would be well to pass a light roller over the ridges. This completes the sowing.

As it is the after culture, which makes the greatest objection to the field cultivation of carrots, we shall be the more particular upon this point. And, first, we observe that the mode, which we have recommended to pursue in

our rotation, by which all the requisite manure is put into the ground the previous year, greatly diminishes the labour and expense of the carrot cultivation. The seeds of weeds usually sown with the manure, having been, in a great measure, eradicated by the cultivation of the potatoe, in the second year of the rotation. If the carrot be sown as soon as possible after the ridges are made and raked, while the earth is yet fresh, it will have the advantage, and get out of the ground before most of the remaining weeds. As soon as it is out of the ground, the care of the plant is immediately to be commenced. Here it may be well to notice a common maxim, in order to improve upon it. It is generally said, "hoe as soon as you can see the weeds." But in relation to this carrot cultivation, the best maxim is, "hoe as soon as you can see the line of plants." Whether you can see weeds or not, be assured they are starting; and this is the moment, which, if lost, and the weeds permitted to get a little in advance, will occasion a very considerable additional labour to the cultivator and of injury to the crop. This first hoeing ought to be on the sides of the ridges, and with a general weeding of the top; so that the small weeds may have no advantage over the carrot. As soon as this is completed, a double mould board plough ought to be run through the furrow, deepening it, and throwing the earth to the plants. Or if the farmer have no double mould board plough, a single plough may perform the same operation, by throwing the earth to the side of each ridge successively. By this early attention, where the cultivation of the preceding year had been also carefully performed, the whole labour of this first weeding often does not exceed three days labour to the acre. Whereas, if the operation be neglected five or six days, it cannot, probably, be so well done by an expense of ten days labour.

In about a fortnight or three weeks, the second weeding should take place. The plants will then have acquired

some strength, and the weeds some size. A single mould board plough may pass up one side and down the other of the ridge, as near as possible, without injuring the crop; and throw the sides of the ridge into the furrow. The plants should then be thinned to the state in which it is designed, finally, to leave them. After this, and after the weeding is completed, a double mould board plough; or, where this cannot be had, a single one should throw the earth, which is in the furrows, again about the plants. This second weeding, if well done, completes all the necessary labour of weeding and ploughing. The crop will, probably, be benefited by a repetition of them both. And if leisure permit, or the circumstances of the crop indicate the necessity of it, they should both be done again. This, however, will hardly ever be necessary; particularly if all the antecedent cultivation has been well conducted. Both these weedings and hoeings ought not to cost more than ten days hand labour for each acre of carrots.

The time of sowing had best be about the middle of May, and ought not to be postponed later than early in June.

In harvesting the crop, a common plough run close to the plants, and throwing off the earth, leaves them standing in rows, so liberated from the soil, as that they are easily pulled up by handsfull, and thrown into carts to be topped and housed.

As in the system proposed, a part of this third year's rotation should include both carrots and turnips, it remains to say something on the cultivation of this root. Of all turnips, the Swedish turnip (Ruta Baga) is unquestionably to be preferred for its productiveness, for its nutritious qualities, and for the facility with which it is preserved late in the succeeding year.

The sowing ought to take place, in our climate, between the tenth and thirtieth of June. With respect to its cultivation, but little need be added to what has been said in

relation to that of the carrot. It is, however, a great point to be attended to, that the seed should be put into the ground upon the fresh earth; that is, the seed should be sown as soon as possible after the ridges are made and raked. The rows ought to be also at a greater distance than those of the carrot; at least three feet a-part, and the plants twelve or fourteen inches asunder in the rows. The first hoeing may be postponed a little later than that of the carrot. However, in general, the earlier after the line of plants can be seen, the better.

With respect to the harvesting the Swedish turnip, no particular remark seems necessary. The mode is similar to that of the carrot, and also familiar to all our farmers.

The preservation of both vegetables, during the winter, is an affair of more nicety and importance. Carrots are easily kept in masses, in a cellar or place out of reach of the frost, provided they be dry when put into it. But if wet, they will be in great danger of heating and decaying. To prevent this, they ought to be taken out of the ground in dry weather. If possible, after they are topped, they should be permitted to be in heaps, under cover, for a week or ten days. This precaution is particularly requisite, where the quantity raised is great. With it fifteen hundred and two thousand bushels may be safely deposited in bulk. Without it, a much smaller will be likely to be injured.

As the want of cellar room is an objection often made to the attempt to cultivate this vegetable, upon a great scale in field culture, it may be useful to state the following mode of preserving them above ground, which has been practiced with success.

Let the roots be dug up in dry weather, and piled on an earthern bank, on which is spread a layer of straw. Let the carrots be laid in two piles upon this straw, with the tops turned outwards, and their ends folding over one another, while the smaller roots are lopt and thrown into the

centre. This stacking may be continued to the height of four feet, when the whole is to be covered with an additional quantity of straw. A trench is then to be dug all round the heap, and the dirt thrown upon the carrots, covering them about one foot in thickness. After this, a little more straw, and with horse manure or sea-weed should be thrown upon the earth, and the whole rounded off so as to shed rain. If this be done effectually, the carrots will be secured against frost, and afford a regular supply of winter food for cattle.

After the carrots are harvested, the land ought again to be thrown into ridges, to expose it to the action of frost, in the same manner in which it was in the autumn of the second year. This completes the cultivation in the third year of rotation.

SEC. IX. OF THE FOURTH, FIFTH, AND SIXTH YEARS OF THE ROTATION—THE BARLEY, CLOVER, AND THE HERDS'-GRASS YEARS.

We shall suggest little concerning the management of the crops during the fourth, fifth, and sixth years, because the common practice of Massachusetts farmers is, in general, sufficiently correct in respect to the grain and grass crops. At least, if it be not, we do not propose here to criticise it. The particulars in which our grain and grass cultivation is deficient, do not enter into the scope of these remarks; which have had principally in view, to give some light concerning the management in the three preparatory years, and to draw the attention of our farmers to systematic agriculture.

As far as our experience extends, the common practice of sowing clover and herds'-grass in the spring, immediately after the sowing of the grain, is superior to that recommended by some European writers, of sowing them in the autumn after the grain crop is harvested. Clover and grass sown in the autumn, are, in this climate, ex-

tremely apt to "be winter killed," as it is termed. For which reason, sowing in the spring is to be preferred.

The small quantity of seed sown for grass and grain, is also, it is thought, a great mistake in our agriculture. There should be never less than twelve pounds of clover, and half a bushel of herds'-grass; and after a thorough harrowing, the seed ought ever to be rolled by a heavy roller. The neglect of this is also a very common error among our farmers. The advantage of the roller, in further burying the seeds, and giving them more advantage from the earth by bringing its parts into close contact with them, is obvious, and needs no illustration.

SEC. X. OF THE RESULTS OF THE ROTATION PROPOSED.

As in the suggestions here made we have had chiefly in view the farmers of small capitals in our Commonwealth, it may be useful to consider the system in its result, after the first six years have elapsed and the rotation is completed.

Let us suppose a farmer owning sixty acres of land, of which thirty acres is arable land, and the residue pasturage. In his present system of management, he ploughs up ten or fifteen acres of land, annually; manures, as well as he can, but without system; always selecting every year such pieces for cultivation as he deems will give that year the most product. Thus the best parts of his farm are every year forced to their utmost productive power; and, if not gradually deteriorated, yet certainly not ameliorated by this cultivation; for his manure, being divided among such a number of acres, is insufficient for their necessities. When his land is laid down, it is kept in grass as long as possible; the consequence is, that the crops of the latter years are small; and the sward becomes matted and bound, so that the breaking up requires a considerable power of team, and a great expense. Grain and grass being sown after only one hoeing or clearing crop (for the most part

potatoes or Indian corn) the seeds of weeds contained in the manure are not extirpated, come up with the grain and interfere with the grass, and materially affect both crops. Such is the scene our farming too often exhibits.

Upon the system suggested on such a farm, only five acres are to be manured annually, but those thoroughly. No farmer, owning such an extent of land, with the quantity of stock this system will enable him to keep upon it, but can command with a little care and attention, one hundred and fifty loads of manure. He will thus be enabled to give to each of the five acres thirty loads. This, although not as much as might be desirable, yet will be sufficient. In the case supposed he has thirty acres of arable land; of consequence, at the end of the first six years of rotation, all his land will be in heart deeply ploughed, and in fine order; and his thirty acres will be in this state of product.

Five acres in Oats, at 2 tons per acre—10 tons.

Five do. in Potatoes, 200 bushels to the acre—1000 bushels.

Five do. in Carrots and Turnips, 400 bushels to the acre—2000 bushels.

Five acres of Barley, 30 bushels to the acre—150 bushels.

Five acres of Clover, 2 tons to the acre—10 tons.

Five do. of Clover and Herds'-Grass, 2 tons to the acre—10 tons.

With respect to the estimated product, we have placed it lower than the farmers of this country have a right to expect, on the average of quality of the lands in the Commonwealth, with such cultivation as is proposed. Thus potatoes managed, as we recommend, can scarcely fail of producing, in good years, two hundred and fifty and three hundred bushels; and in good land, the manure being also good, four to five hundred. So also with carrots; we know that four hundred bushels of carrots is only an ordinary crop in this mode of management, and that five and

six hundred bushels may reasonably be expected. The other estimates of the probable quantity of products, are also systematically placed lower than may fairly be anticipated.

If such farmer be located at a distance from the market, this quantity of hay, oats, and vegetables, will enable him to keep at the end of the six years' rotation, fifteen head of cattle, or an equivalent number of any other stock. Besides the profit upon the stock, the manure cannot be less than two hundred loads. Let any owner of sixty acres of land, compare this result with that which he at present realizes. Let him also take into view the state of his land, at the end of the first years of such a rotation, compared with its present state. We have no apprehensions, but such a comparison will every where be sufficiently encouraging.

With respect to the money price of these articles, it is difficult to fix any general estimate, for every part of the Commonwealth. But we apprehend that the oats, clover, and grass, will be estimated sufficiently low at ten dollars the ton; the barley at one dollar the bushel; the potatoes, carrots, and turnips, at twenty-five cents the bushel. The money product of these thirty acres will then be the following:

30 tons of Oats, Clover, and Herds'-Grass Hay, at $10 per ton - - - - - - - -	$300
150 bushels of Barley, at $1 - - - -	150
1000 do. of Potatoes, at 25 cents - -	250
2000 do. of Carrots and Potatoes, at 25 cents	500
	$1200

A cash product of $40 the acre. This, we apprehend, is its lowest estimate. In far the greater part of Massachusetts, the value of this amount of articles would be greater.

It remains to add a few words relative to the necessary expenditures on a farm, managed upon this system.

The great discouragement of our agriculture, if you believe the complaints of farmers, is, the high price of labour. It may be questioned, however, whether the greatest discouragement be not the want of system, and inattention to the application of all the facilities, which connect themselves with the practice of their art.

A farm of this number of arable acres ought, and may be managed by two men all the year round, with occasional help during the harvesting season.

The labour of the farmer and his family we estimate at - - - - - - - - -	$250
That of one man at $12 - - - - -	150
That of extra help - - - - - - -	100
The support of the family we estimate at -	200
Making the aggregate of expenditure - -	$700
To this may be added taxes and incidental charges	50
Total, - - - - - - - - -	750

Against incidental charges also may be placed, by way of off-set, various small incomes from fruit, wood, the garden, and the like—leaving a net balance of cash, or what is better to the farmer, of value in productive stock, of - - - - - - - $450

Our remarks have been made upon the basis of a farm of sixty acres. The average value of which farms in the Commonwealth may be estimated, we apprehend, at $75 the acre. This is equal to a capital of $4500.

Upon which capital the net balance of profit is equal to an interest of ten per cent., after deducting a full compensation for labour and expenses. The profit, however, is necessarily much greater than this. Because, upon this

system, a regular and systematic amelioration of the farm is contemplated, which is so much an annual increase of capital. Considering the nature of the investment, its security, certainty, and the many incidental advantages connected with a farming life, it cannot but be admitted, that the result is sufficiently encouraging.

SEC. XI. THE BENEFIT OF ROTATION IN CROPS FARTHER CONSIDERED.

It is scarcely possible for a farmer to conduct his farm long, upon a principle of regularity in the rotation of his crops, without perceiving the most solid advantages resulting. First, this principle necessarily extends his view, in relation to his agriculture. His calculations must, in such case refer, and all his operations be conducted in relation, not to the product of a single year, but to that of all the years included in the rotation. Of consequence, he omits nothing, and sacrifices nothing for the sake merely of the present year's profit. In the usual way of management, a farmer is extremely apt to be led away from the pursuit of the great object of wise attention, the general amelioration of his farm, to a mere temporary object—this year's profit. His manures are divided about on his land; a little to the Indian corn, a little to the potatoes, a little to the top dressing of his grass lands. In three or four years, he has nothing to show for it. He hardly knows himself, at the end of that time, how it has been distributed. Now, nothing is so likely to be done effectually, as when it is done systematically. If the farmer's principle be to manure but once in six, or seven years, and he knows that all his arable land will have the same chance, in that period, he manures more liberally because his fund of manure is relieved from the contending claims of rival crops. His attention, also, is not distracted towards a variety of objects. His round of duties are every year the same. One year's experience is immediately beneficial to the rest. The little facilities.

and the little economies, on which so much of agricultural success depends, are more easily practiced or observed. Besides, incidental advantages result, which are not anticipated. Thus, for instance, the habit of laying down land to grass, without having any fixed period, at which to break them up, leads to a postponement of that operation as long as possible. After the second year, the herds'-grass crop begins to dwindle. This leads farmers to top dress, for the sake of getting a year's good crop. In this they are usually successful. But it is by the loss of one half the manure, which is thus spread upon the ground, and a great part of the riches of which are, when spread in this way, either evaporated by the sun, or washed away by the rain. Now rotation excludes top-dressing. All the manures are ploughed into the soil, and amalgamated with it. Nor is top-dressing here necessary. Because, before the grass dwindles from lapse of time, the plough comes over it, in its regular rotation, and the roots of it and their aftermath are made to contribute to the succeeding crop.

Another consequence of laying land down to grass, and having no regular period for breaking it up, is, that this operation is almost never performed, so long as the land will yield any thing to pay for mowing. The consequence is, that the land becomes "bound out," as it is called; that is, the sward has grown so hard that plants of tender fibre will not shoot through it, or flourish in it. The result of which is, that it is so tough in the sward, that no plough with a single yoke of oxen can turn it over. Hence it results that, perhaps, nine-tenths of our breaking up, in Massachusetts, is done with two yoke of oxen, and by two men; one at the cattle, and one at the plough handles; at the enormous expense of three or four dollars the acre. This expense renders the farmer unwilling to break up often, and causes him to neglect, much more than he ought, that great instrument of agricultural riches, the plough.

Now we venture to affirm, that there is no land in Massachusetts, which, after having been subjected to the course of rotations here suggested, may not be broken up, by a plough running with one yoke of oxen, and driven and directed by one man. By which, one half the labour of that, perhaps, most expensive of all agricultural operations, is at once saved. For this purpose, however, the plough must be of a well selected kind, and the oxen good. On these topics the Trustees mean to enlarge in some future number of their Repository.

There is another effect naturally, though not necessarily, growing out of a system of rotations; the abstaining from pasturing mowing lands. A system of rotation can only be applied to arable lands. This leads to a permanent division of the farm into arable land and pasturage. The interior fences, between the lands destined to the plough, will soon be found useless for all purposes, except that of pasturing his cattle upon the aftermath, or autumn feed of the mowing lands. When the saving of the expense of these interior fences is taken into connexion with the short time grass is permitted to occupy in each rotation, and the great injury done by the hoof and the tooth of cattle, the good sense of our farmers will gradually come into the practice of keeping their mowing lands exclusively appropriated to the scythe, during the years in which grass is permitted in the rotation.

The subject admits of much greater illustration. But we have already exceeded the limits we proposed to ourselves in the commencement of these remarks; the object of which has been, to draw the attention of intelligent and practical farmers to the subject, in the hope that it may lead to a better practice, than at present prevails in some parts of our state; and also to a fuller elucidation of the topics by some more competent hand. C.

ON A WORM, WHICH ATTACKS THE APPLE TREE. BY JOHN PRINCE, ESQ.

[To the Corresponding Secretary.]

Jamaica Plains, July 1819.

DEAR SIR,

I HAVE, within a few years past, lost a number of apple trees, of ten to fifteen years old, and was not able to account for it. My young trees, also, that were beginning to bear, produced chiefly wormy and knurly fruit. The last year I found what I supposed to be the cause, which was, a small white ringed worm, about 3-4ths of an inch long, with a dark coloured head, (I believe the same that attacks the peach tree,) attacking them at and just below the surface of the ground.

I mentioned the subject to Professor Peck, yourself, and several other gentlemen, who had never heard of this destroyer of the apple tree. I feared much the loss of all my trees, of which I have near one thousand, and mostly of my own planting.

This spring, a man who was grafting for me some old trees, told me he had trees that had been affected in the same way, and that they were very easily got rid of, by digging round the tree and clearing away the earth to the roots, and then with a sharp pointed knife, a chisel, or gouge, (and a small wire to probe, if they were deep in the tree) they were easily destroyed. I employed him in June for this purpose. I believe there was not an apple tree on my farm, but had some worms; and from some of them *twenty-four* were taken, and the trees almost entirely girdled, and would not, probably, have lived through the year.

After taking out all that could be found, the wounds were covered over with grafting clay, and a large propor-

tion of dry wood ashes mixed, and the earth then returned to the tree.

I shall have them again examined this fall, and looked at every spring; the trouble is much less than would be imagined, till tryed. One capable man will dig round, and turn the sods, two or three feet from the tree, (and which is also extremely beneficial to young trees in grass ground,) and examine at least thirty trees, in one day; and in garden, or ploughed ground, one hundred.

When it is found how little expence is required to extract these destructive little worms, I do hope, those persons who have young trees particularly, would examine them as soon as possible.

They are soon discovered by the worm casts, or *saw dust* borings, which should be followed, and wholly extracted.

I have also lost several mountain oak and quince trees, by, I believe, the same destroyer.

Very respectfully yours,

JOHN PRINCE.

ON FREEBORN'S PATENT PLOUGH.

[To the Corresponding Secretary.]

Boston, September 1, 1819.

I RECEIVED early in the spring of this year, from Isaac Bronson, Esq. of New York, a plough denominated by him, "Freeborn's Patent Plough." Having found upon trial, that it fulfilled all the expectations Mr. Bronson had previously raised concerning it, I requested him to write an account of its character and success. His letter is inclosed, which you are at liberty to publish, should it be deemed useful.

Concerning its superiority, I have had the opinion of every practical farmer, who has witnessed its operation, I believe, without an exception. The effect upon my farm is this; that I now break up, with ease, the same quantity and qualities of land, say one acre, in a day, with one yoke of oxen and one man, who both holds and drives, which was never before, to my knowledge, broken up with less than two yoke of oxen and two men. My ploughmen agree, that it takes one third less power to do the same work than common ploughs require. One of them to express his approbation of it, said, "That poor as he was, if another such plough could not be bought, he would give one hundred dollars, rather than not have it, had he a farm of his own."

It is the best plough, beyond all question, I have ever had upon my farm.

Respectfully,
I am your obedient servant,
JOSIAH QUINCY.

New York, May 8th, 1819.

[To Josiah Quincy, Esq.]

DEAR SIR,

I AM happy to learn by your esteemed favour of the 10th ultimo., that Freeborn's plough, which I had the honour to send to you, has been found upon trial to answer my recommendation. The best evidence of the superior properties of this patent is, the universal preference given to it by the farmers. Mr. Freeborn informs me, that he has sold more than six hundred within the last forty days, to farmers residing within thirty miles of this city; and that he sent more than one thousand, last year, to the state of Virginia. The demand increases so rapidly, that his factory is not able to supply it, although he makes from

two to three thousand a year: and yet it is but a little more than two years since they were first introduced. There are three sizes, suitable for one, two, or four horses. In any kind of land, which is in a condition to be ploughed, some of these may be used to advantage. In new lands, where there are many roots or stones, the largest size, with a wrought iron share and locked colter, does best. For this purpose, the nose of the share must be pointed to suit the eye or mortice in the colter; but in other respects it should be made like those which are cast. Any smith can make them. This share and colter may be taken off, and a cast share and cutter used in their place, or the share without the cutter. In stony ground, where there are no roots, a share of wrought iron laid with steel, shaped exactly like those which are cast, is preferred, without either cutter or colter. One set of screw bolts fasten all these different shares. There are three notches in the clevis, either of which receives the hook of the chain, and by which the depth of the furrow may be regulated: and for the same purpose the beam can be raised or depressed, by turning the nuts on the upper and under side of the beam, on the screw which passes through it. The pin of the clevis serves as a wrench for turning the nuts; and by having three holes for it, at the end of the beam, the plough may be set more or less to land at pleasure. After the irons become polished by use, it will be found that the plough passes through the ground with very little friction, and with much less draft than other ploughs of the same size, owing probably to the spiral wind in the plane of the mould board, combining, in some degree, the powers of the wedge and screw, in raising and turning the furrow. A supply of new shares, which is the only part liable to be worse for wear, may always be had at sixty cents each, by sending to the factory the number of the plough. The following are the prices:

For No. 1, or the one horse plough without the cutter. $12 50—cutter $1.

For No. 2, or two horse plough, $15—with cutter $16, and locked colter $17.

For No. 3, or four horse plough, $16—with cutter, $17—locked colter, $18.

Number three is the most useful plough, when complete, where only one is kept. There is another size which they now make, distinguished by No. 1 1-2, suitable for one or two horses, which costs, with a cutter and two extra shares, sixteen dollars.

With great respect, I am, Sir,

Your most obedient servant,

J. BRONSON.

ON THE INSECT FOUND IN APPLES AND PEARS.

[To the Corresponding Secretary.]

Charlestown, July 12th, 1819.

SIR,

In the third volume of Dr. Willich's Domestic Encyclopœdia, first American edition, by Dr. Mease, page 116, under the article fruit trees, there is an account of an insect, called the Curculio, by Dr. James Tilton.

It is there stated, that this insect, belonging to the beetle order, delights most in the smooth skinned stone fruits; but when they abound, will attack the apple and the pear; that pears are less injured by the insect, than apples; and that the insect escapes from the fruit to the earth, where, like other beetles, it remains in the form of a *grub* or *worm* during the winter, ready to be metamorphosed into a *bug* or *beetle*, as the spring advances. He supposes, that the curculio preys upon the roots of fruit trees, during its retreat, below the surface of the earth.

In the above, Dr. Tilton professes to describe the insect which preys upon the fruit in Pennsylvania and Delaware, but does not affirm, that it is found in the other States, though he thinks it probable that it is.

From Dr. Tilton's communication, above referred to, the reader might be led to believe, that the curculio, therein described, is the same genus of insects with that which is found in pears, but more often in apples, in the vicinity of Boston. This, however, is not the case, as will appear by the following statement:

The insect found in apples and pears, in this part of the country, causes much of the fruit to ripen, or rather to die, before it is fully grown; more probably, to fall to the earth while green, and by preying upon the pulp, near the core, sometimes perforating to the surface, together with the unsightly appearance of the worm itself, causes the apple or pear to be very often rejected as unfit to be eaten.

Perceiving one of the insects last mentioned, in the core of a St. Michael pear, I placed this core, containing the larva, in a wooden box, about two inches in diameter; and having removed a part of the bottom of the box, instead of the part removed, I put a piece of glass that I might be enabled to see the insect.

On the thirteenth of October, 1818, I observed in the top of the box a small fibrous covering, intermixed with very small pieces of wood. This covering contained the insect, which had changed into the pupa or chrysalis state. The core was placed in the box about the first of October. I left small apertures to admit the air.

By its placing its web in the top of the box, I conclude that the insect, on leaving the fruit, does not enter the earth, but ascends and forms its web, in some dry situation.

In this state the pupa remained in my office, where water freezes in the night when the weather is cold. On the morning of the twenty-third of June, 1819, when the insect had been in the chrysalis state during a period of eight

months and ten days, I saw that the fibrous covering had been burst at one end, and a greenish shell, of the size and shape of the larva, evidently its skin, lay partly excluded from the fibrous covering. One end of this shell was also broken. On looking further I perceived, laying in the box on its back, without motion, a small moth or miller.

On opening the box and touching the miller, it flew very briskly toward the window, where it was caught and again shut up in the box.

The body of the miller is rather smaller than the above-mentioned insect, from which it originated. It has four wings, which, when it is not in motion, are partly closed, so that it has the shape of a fan half shut. The upper wings, which conceal the lower ones, have undulating stripes across them, of a dark colour, on a ground of light slate colour. The eyes, when the miller is alive, are of a deep black. The antennæ, the bottom of its body, and the legs, which are six in number, are of the colour, in the living moth, of a new slate pencil.

I had afterwards placed the core of an apple, containing one of these insects, in the same box. This worm formed an outside covering similar to the other. This I examined on the sixth of July, and found that the insect had died before the inside of the fibrous covering was completed.

The exact similarity of the situation, shape, appearance, and materials of the coverings made by these two insects, proves, I think, that they both belong to the same species.

On taking away the covering from which the phalœna had arisen, I found that the larva had bedded itself in the pine wood, of which the top of the box is composed, by eating away the wood till it had formed an excavation of the length, breadth, and in the middle, of about half the depth of its own body. The bottom of this excavation, as well as the inside of the fibrous covering, was lined with an exceeding fine silky substance. The small morsels of wood which had been taken away, were every where mingled with the fibrous covering above, and contributed to its

strength and hardness. The operations of making the covering and the excavation, must, therefore, have been carried on at the same time.

Whether the male and female are of the same form, in what manner they deposit their eggs in the young fruit, and at what time, &c. are questions which I have not an opportunity of solving.

King-birds and swallows, more particularly the latter, probably destroy numbers of these millers.

This circumstance is, perhaps, a new reason, why farmers should protect the swallow, and endeavour to increase the number of those birds.

I am uncertain, whether the nature of this insect has been before investigated, but I do not know that it has; if it has not, the above, though very imperfect, may lead some one, who has better opportunities, to examine the nature more completely, not only of this, but of those which prey upon cherries.

I send herewith the top of the box above mentioned, in which you will see the excavations; also the fibrous coverings of both insects, the shell, and a part of the miller. I regret that my ignorance of the extreme fragility of the insect's form caused it to be broken.

Yours respectfully,

JOSEPH TUFTS.

CONSIDERATIONS CONNECTED WITH A SURVEY OF THE AGRICULTURE AND MANUFACTURES OF MASSACHUSETTS.

[Communicated for the Massachusetts Agricultural Repository.]

It is desirable to see spread before the public, a full account of the annual products of the soil, and a statement of the amount of manufactures in Massachusetts. We can

conceive of no measure so likely to give a spring to our husbandry. We know that our agriculture feeds and clothes hundreds of thousands, besides furnishing a respectable export. But all this is done with so little observation and reflection, that we appear not to be aware how much we are indebted to the rugged soil of our state, poor as our husbandry is; and are willing to hear, with too much of acquiescence, the scoffs against the occupation of the husbandman, proceeding from those who know little more of it, than that their tables are daily spread with the fruits of it. An inquiry, such as we would propose, would give results shewing the agricultural and manufacturing character of every county, and the distinguishing features of each. We should then know their resources respectively, and be able to speak with better grounds of discrimination, of our dairy, grazing, grain, and manufacturing counties. In a country so new as ours, it may be thought that such distinctive appellations would be premature. But so far as they could be justified by the present pursuits of the population of different counties, it might be of use to apply them. The discovery and publication to the world, that one country was distinguished for its fine cattle and numerous herds, its dairies, and the excellent quality of its butter and cheese; a second for its grain crops; a third for its woollen fabrics; and a fourth for fabrics of cotton—that such a proportion of the inhabitants of one town were engaged in the manufacture of straw bonnets, amounting to a large sum in the year; and that another was no less distinguished for some other branch of useful manufacture—the notoriety of all this would re-act as a stimulus to industry; and what is still more important, the distinct, clear, and satisfactory knowledge the public, and our agricultural societies would have, of what is going on amongst us; whence we derive the various articles for the supply of our wants; from what districts specific commodities come, and to what amount; would enable us to

apply any aids for the encouragement of industry, more understandingly and effectually; and knowing in what particular districts improvements in any one art or branch of husbandry were most needed, government, or the agricultural societies, would apply their efforts to effect the object with more success, by appropriate encouragements.

Our agricultural societies are now numerous; sufficiently so, probably, to be able to furnish complete accounts of the different crops, and amount of manufactures the present year, throughout the Commonwealth. The details might be collected by committees from their own body, assisted by the assessors of taxes. Such an investigation might, perhaps, form the basis of a series of systematic efforts on the part of these societies. An accurate knowledge of their respective districts, such as would result from a minute inquiry and proper statement of their annual products, connected as it would be with an acquaintance with the soil and methods of husbandry, would naturally lead to a serious consideration, how far the aggregate of the harvest corresponded with the capabilities of the soil, assisted by a judicious husbandry. It would be perceivable, at one view, how large a sum the difference would be between the gain of a negligent, and that of a skilful culture, on the mass of crops in the whole county; a sum which, in some cases, would be found to be greater than the public expenses of the county for the year. This further benefit would arise, in obtaining from individuals an account of the produce of their farms, considerable variation would be remarked in the quantities, where, perhaps, none ought to be expected, considering the qualities of the natural soil, and the equal extent of the farms. Whence arises this difference, would naturally be asked? Is it in the quality of the implements? Is it in the character of the stock? Is it, that in the one case artificial means are made use of to make manure, and not in the other? Is it in the greater economy of the household? Is it that the wet meadow is on one farm

farm ditched and warmed with a coat of gravel, and not on the other? Is it that the fruit trees are pruned and kept clean, and the soil kept open around them while young, in the one case, and not in the other? Is it that the barn is open between the boards, and lets in the weather, so as to injure the hay in one instance, and not in the other? Is it that the farmer in one case ploughs his lands in the fall, and the other does not? We think questions of this sort would naturally arise in seeking the results of farming operations for the year; and the answers to them, as often as they could be obtained, would furnish a mass of valuable facts, on which to ground a course of very efficacious measures of reform; one of which might be, to confer rewards on those whose farms should be found remarkably well husbanded. The distinction which a reward for good husbandry would give, as it would have for its basis the character of the man, would operate more powerfully on others as an incentive, than a premium obtained at a cattle show, for a fat ox or fine sheep, as the animals might be an accidental acquisition by purchase, and their quality in no degree connected with the general skill or habitual application to the best methods of husbandry on the part of the owner.

We may add further, that as the life of the husbandman is more retired and independent than that of most other classes, and he naturally feels less concern about other people's opinions, in relation to his mode of managing his own concerns, he is less likely to derive benefit from the light of other men's minds, or their better management of their property. The proportion of men is small, that, from the impulse of their own mind, labour more than their necessities require. It is therefore important, that farmers should be awakened to feel that they are united by ties of interest, as husbandmen; and that by lending the aid of their counsel and experience to teach each other, they may one and all be benefited. To this end, it may be useful to shew the sum of the produce of one farm added to that

of another, and that of all the farms of a county, gathered into one gross amount, and held up to the world as an object of common pride and interest, and set in array with that of the other counties; displaying a mass of agricultural wealth, which, as it may teach our farmers to respect themselves more, will attach them more to each other, and incline them more heartily to engage in measures for common improvement, and the advancement of their common interest. Whenever men unite in a common object of interest and honour, whatever intelligence and activity belong naturally to the few, are always in a greater or less degree transfused into the whole. If our farmers once acquire a strong interest in the agricultural reputation of their county, they will stimulate each other to the improvement of their farms, and, by making a common cause, add the incentive of public opinion to that of their own necessities. Suppose the Agricultural Society of Worcester should commence a formal inquiry, what number of acres are usually under cultivation in that county? The next question would be, what does this number of acres yield of the different kinds of crops? And what quantity of each to the acre, ordinarily? What farms there are that do much better than the average, and why? What different processes are pursued to accomplish so much more? If the estimated value of the crops of the whole county is so much now, it might be in the power of the society to convince the farmers, that they may double this amount by imitating some individuals among them in a few particulars, in which it might be done without much, if any, additional expense. Such as, throwing aside their old and badly constructed ploughs, and using those of late invention, which have been proved to be a great improvement on the old. A single fact will place the importance of this recommendation in a striking light. On a trial, in England, to ascertain the quantum of power required to draw different ploughs, it was found that some, although lighter than others, em-

ployed one third more power to move them in the furrow. The instrument used to ascertain the draft, was of simple construction, and might be relied upon to give an accurate result. The difference arises principally from the form of the *mould board* of the plough. The writer of this communication has seen in operation, on the farm of the Hon. Mr. Quincy, one of Freeborn's Ploughs, marked No. 3, made in New York. One man, with a single yoke of oxen attached to this plough, was breaking up land, which had always required, with a common plough, two yoke, a driver and a man to hold the plough. The lines of the furrows were straight, and the sods turned completely over; and what was particularly worthy of remark, the cattle laboured without any apparent exertion.

Fall ploughing for spring crops, if it were universally in any one county, and followed up by so many ploughings in the spring, as, with the aid of the harrow would reduce the soil to a mellow state, would make a prodigious difference in the aggregate of the gains of the county. By presenting a view of the benefit to a large district of country, by the introduction and general adoption of any one improvement, our agricultural societies may do much good. The average crops in England, with the same labour, no more manure, and land of the same quality, are much greater than in this country. Their implements are better, and their husbandry more skilful. It is in our power to procure, therefore, as good returns from our lands as they from theirs. We would refer the incredulous to the printed accounts given in, under oath, of the crops of potatoes and carrots, for which premiums were granted by the Trustees of the Massachusetts Agricultural Society, at the Cattle Show last year. These accounts may be found in the Repository, published last January. From them it appears, that the net gain, upon an acre of carrots, amounted to between two and three hundred dollars. Now it is of no more consequence to a poor man than to a rich one,

how many days labour a field of carrots may require, provided he is not only sure of being indemnified by the crop, but may be almost equally sure of making ten times the profit by a careful, that he would do by a slovenly and imperfect culture. When our farmers see accounts of crops of six, and even eight hundred bushels of carrots to the acre, and almost as many potatoes, they are apt to suppose, that all the difference between a common crop of one hundred and fifty, or two hundred bushels of potatoes, and two or three hundred of carrots, and the above, is the effect, if not of magic, at least of so much additional labour and manure, as would exceed, in value, this difference. Hence it is so rarely the case, that farmers in general avail themselves of the experience of the few who have been greatly successful, from superior method, diligence, and skill. And although the whole mystery may be resolved into thorough tillage, clean husbandry, and a liberal use of manure, the common cultivator will have it, in the face of well authenticated facts, that there is some secret fallacy, and that he, of course, who has the best managed and most productive farm gets the least profit, and that a man is poor in proportion to the magnitude of his crops! The only means of counteracting this bigotry to the ways in which they have been educated, is to bring frequently into view of the farmers, examples as near home as they can be found, of substantial profit as the fruit of every improvement. Our county agricultural societies may do this, not only by means of the exhibitions and statements, offered at their annual shows, but by disseminating information, through the medium of the newspapers, of improvements which are introduced from time to time on particular farms, whether in the stock, implements, or management of manures, as any such may fall under their observation. The clergyman, who is in the practice of visiting every house in his parish, and places himself on an intimate footing with his people, obtains a knowledge of their characters, habits,

and circumstances, which, if he is a practical and sagacious man, he may employ to maintain over them an uninterrupted and salutary authority. And we know not why a town or county agricultural society, may not propose to itself to become acquainted with the business of every farm within its own sphere of operations, and establish, by its influence, a sort of voluntary accountability on the part of the farmers to itself. Or, as it is probable, that most, if not all, the substantial farmers, if invited, would join such a society, why may we not hope, that they will pledge themselves to each other, to adopt whatever improvements the sense of the Society may recommend?

As the character of the staples of Massachusetts is humble, compared with that of the southern states, we sometimes hear agriculture spoken of, as a pursuit, in terms of derision. But we know of no part of the world, in which the great body of the people have it in their power to live more independently and happily, than in this Commonwealth. And if the hazards of foreign trade are taken into view, there is no class of men, who hold their earnings in so great security as the farmers, or who have it so certainly in their power to better their condition, by regular and progressive steps. This may be accomplished by no more labour than is healthful; no more frugality than may be called by the names of temperance and moderation; and no more thought, calculation, and reflection, than becomes the dignity of man in any calling. Whatever discredit our agriculture may be in, among intelligent men, is owing wholly to our bad husbandry. And it is no doubt true, that there are many farmers among us, who are poor men, with a farm of from one to two hundred acres of land. It is common to hear husbandmen complaining of the burden of public taxes, and that these eat up their profits.

This suggests another reason, for which it is desirable that an account should be taken of the produce of agricultural industry in this State. We think it would turn out,

that in those districts of country, which are well cultivated, the public burdens bear a very small proportion to the proceeds of the labour of the people. And were the soil of Massachusetts husbanded with the skill and care, which would entitle our cultivators to be called good farmers, we should hear no complaint of taxes in this most favoured country. To shew this in a striking manner, it will be gratifying to have it in our power to compare the total of our crops the present year, with that of the year 1825, as we doubt not that no inconsiderable improvements will have taken place in the mean time; judging from the spirit which now appears to prevail.

It occurs to us also, that if, in those counties, in which any one branch of husbandry is more particularly attended to, the inhabitants could see, stated in figures, its annual value, it would give to it more importance in their eyes, as they would have a more distinct apprehension of its extent, and have a clearer perception at once of the whole benefit to arise from any proposed improvement. Berkshire, for example, is distinguished as a grazing county. If it were known what number of cattle are annually driven to market from thence, perhaps, as few among the inhabitants have made any calculation, the number might be greater than any are aware of, and the interest of the county much more concerned in cultivating only the best breeds, than has been supposed. If, then, it were found to be true, that the race of cattle, though large, yielded less flesh, in proportion to bone, than some other breeds of a middle size, and that the difference in profit on the latter, would be equal to from fifty to an hundred pounds a head, there can be no doubt, that the advantage of a change of breed would strike even the most indifferent as an important object.

Every one knows, that the crops of Indian corn were generally cut off by the frosts, in 1816. Had it been known what quantity of Indian corn is usually raised in a season in the county of Middlesex, for example, the loss in

1816 would, probably, have been so much more felt, that more attention would have been paid to the recommendation of a species of corn cultivated by Mr. Pomroy, of Brighton, and others; not a field of which suffered by frost in that year. This species, besides, bearing a large and fruitful ear, husks itself when ripe.

The effects of negligent husbandry, exhibited in its consequences, when it pervades a whole county, might, we think, afford an impressive lesson. All who have had occasion to pass through the county of Norfolk, in different directions the present season, must have been struck with the extensive ravages of the caterpillar, in the apple orchards. The first growth of leaves, of probably two-thirds of the apple trees, were consumed by the caterpillar. Nature was, of course, compelled to make a new and exhausting effort to supply foliage from the buds designed for the next year—"thus anticipating the growth of one year, and cutting off the prospect of fruit."* We will not undertake to estimate the loss to the county, but whether small or great, effectual means of destroying these vermin were within reach of every farmer; nothing more being necessary than to dip a sponge or rag, attached to a stick of proper length, in oil or strong soap suds, and apply it to the web. One thousandth part of the value of the fruit which will be lost the next season, in consequence of the neglect of this operation, would have paid the labour of performing it. Suppose there had been a county agricultural society for Norfolk, and that it had been the practice of procuring a valuation of the crops every year, of fruit, as of other kinds. With the knowledge it would have possessed of the loss to be sustained by the county the next season, by the caterpillar being suffered to remain unmolested, would not some effectual measure have been adopted to rouse the attention of the farmers to a sense of their interest, before it was too late?

* Professor Peck's Natural History of the Slug Worm.

We have thus ventured to speak with some confidence of the responsibility, which rests on the county agricultural societies. As all the members are farmers, they may not only point, but lead the way in improvements. And by exhibiting to the public the state of agriculture, in their respective counties every year, in statements of their crops and produce of manufacturing industry, the people of the Commonwealth will be furnished with the best evidence of the character of each county, and the inhabitants of each county with the most powerful stimulus to persevering exertion.

ALMS HOUSE FARMS.

[To the Corresponding Secretary.]

SIR,

I HOPED to be able to obtain for the present Number of the Repository, a sketch of the history and economy of the Alms House Farm in Salem. Those who have seen the account of its last year's produce, published in January, may have some curiosity to know more of the establishment.

As a well managed and uncommonly productive farm, it might afford a useful lesson to most cultivators. But, considered in another light, as an experiment to determine the practicability of drawing a support for the poor from their own combined labour, in the diversified operations of a farm, it is of incalculable importance to the whole community. Whether the farm has, in past seasons, yielded enough to provide common necessaries, and an overplus sufficient to defray the general expenses, we are, at present, unable to say. But even if it pays no part of the general expenses, and only a part of the maintenance, this is much more, we believe, than the labour performed in any other Alms House establishment, has ever before accomplished. Future accounts from this institution may

go far to settle for *us*, at least, the question, which has so much perplexed the world, viz. *Whether the poor can be made to support themselves?*

But that which favours the plan, in point of policy, as well as humanity, is its admirable fitness to accomplish all the ends of such an institution, by not only providing every comfort on the most eligible footing, for the sick and infirm, but constant employment adapted to every age, degree of strength, and grade of intelligence. It is excellent in every view of it, and recommends itself strongly to the adoption of all our large towns.

The Alms House, on the old plan, gives shelter to such, among other persons, as do not, or cannot, whether through natural incapacity, idleness, or vice, provide themselves a subsistence. But, in fact, the design of the institution, as an infirmary, seems so far to have pre-occupied the public mind, as to have prevented the thought of engrafting upon it any scheme for the regular, full, and profitable employment of all who are able to labour, with a view of defraying from the avails of it, any considerable part of the expenses of the establishment.

It is true, that in most Alms Houses there is a work-room; but the intent is more to keep loungers out of the way of the household business, and from absolute idleness, than to derive a profit from their industry. Their employments are, therefore, of the most simple and least productive kinds, requiring neither much exertion of strength, skill, or ingenuity. Besides, the inconveniences of a sedentary life, and the effects of confinement with a crowd in a close work-room, both as respects health and morals, more than counterbalance the advantage. We as commonly hear of the Alms House fever as of the Gaol fever; a slow intermittent, the offspring of a life of inaction, confined air, and uncleanliness. To say nothing of the tendency of the circumstances to which we have alluded, to encourage in a hundred forms, those grovelling vices which make many

of the poor of Alms Houses, as depraved as they are miserable.

In turning our eyes from a scene like this to the establishment at Salem, we are refreshed by the contemplation of one so different. Among the poor of all ages, and both sexes, there are few to whom the endless variety of the operations of the farm, does not furnish some healthful and profitable employment. We know that a faithful and economical husbandry, embraces, as important to many useful purposes, many kinds of very light as well as heavy labour. So that children of a tender age, as well as the infirm and superannuated, may, by slight offices, sometimes contribute materially to the success of the season, as well as the general melioration of the farm. An enlightened and sagacious superintendant assigns to each person, male and female, an occupation suited to their capacity and strength. And being himself thoroughly conversant with every branch of active and economical husbandry, he can be at no loss for something for every one to do. Knowing, as every good farmer does, how much success in point of profit, depends on a careful execution of a systematic plan of saving, and turning every thing to account, he is aware that there need never be an idle hand, however numerous his household. The bounty of nature is inexhaustible. She never fails to make ample returns for the most scrupulous nicety of cultivation.

How noble, how praise-worthy, is such an establishment! Pauperism here throws off all the badges of its degradation, with the habits which makes it odious. A.

REMARKS ON SOIL.

[From the Writings of Agricola.]

When we cast our eye on the surface of this globe, and observe such a multitude of materials, differing in their

colour, bulk, form, weight, and other sensible qualities, all of them scattered in disorder, and blended in endless combinations, we are ready to conclude, that their number must be infinite, and their disposition under the guidance of no general laws. No judgment could be more precipitate, or worse founded. In this apparent scene of confusion the utmost regularity prevails: and the whole mass is made up of a few simple ingredients. The order of the parts is so determinate, that it obtains not only at the surface, but in the very bowels of the earth. The internal structure is composed of strata, either loose or solid, as far down as human art has been able to penetrate, and the presumption is, that they extend to a vast depth. With regard to Agriculture, our geological inquiries are bounded to the soil, on which we tread, and to the substratum which supports it. These, in a judicious system of Farming, are objects of great interest and importance; and both of them should be examined with a scrupulous nicety. The obstacles, which baffle the hopes of improvement, are just as likely to lie in the subsoil, which is placed beyond the reach of the ploughshare, as in the upper surface, which is more immediately subjected to culture; and for this reason, neither of them ought to be overlooked or disregarded. A coat of stiff clay has been rendered productive, by the mere circumstance of resting on a bed of sand, or a rock of limestone; and, therefore, every cultivator, who wishes to pursue a course of good management, should go over all his fields, by digging pits in various places of at least eighteen inches down, that he may know and discover the materials on which he is to operate. He can then lay his plan with greater certainty of success, and, what often happens, the subsoil may furnish him with the means by which to ameliorate the surface.

In the progress of this letter, I shall direct the attention of my readers to the component principles, which constitute that exterior covering of earth, with which our globe

is encompassed; I shall enumerate and explain their qualities so far as respects vegetation; and I shall point out some of the advantages which must result to Agriculture from beginning to analyze our soils.

Notwithstanding the different appearances which the surface exhibits, it is, in reality, compounded, in all its varieties of wet and dry, of warm and cold, of light and heavy, of barren and fruitful, only of four simple and primitive earths—clay, sand, lime, and magnesia.

I. Clay, called indifferently in agricultural publications, alumine, or argillaceous earth, is a substance so easily distinguished from all others, and so familiarly known, that it needs no particular description. When pure, it is white; but in general it is found discoloured by the mineral waters, which are perpetually escaping from their beds, and running on the surface. It is tinged with blue, brown, gray, and red shades, for it has a strong affinity to all colouring matter, but these tints affect it not materially in an agricultural point of view, and are, therefore, of little consequence. As an ingredient of soil, it has the four following properties, by which it exerts a powerful effect on vegetation:—

1st. It absorbs water like a sponge, and is so close in the texture, as to prevent it from filtrating through its pores.

2d. When thoroughly soaked, and afterwards dried, it hardens and cakes into a solid mass.

3d. It shrinks considerably in bulk, when exposed to heat, and the contraction of its parts is in proportion to the intensity of that heat.

4th. It powerfully retards putrefaction, by enclosing, as in a case, animal and vegetable remains, and thus shutting out the dissolvent action of the external air.

If we now call to our recollection the purposes served by the soil, and detailed in my last letter, we shall be enabled to judge how far clay, in its original and unsubdued state, is favourable to vegetation. The roots, which are the collectors of the nutriment, and are withal of a ten-

der and delicate texture, cannot easily stretch themselves in a substance of such stiffness and tenacity; and which, besides, so readily consolidates after rain into a compact body. Its closeness opposes material resistance to their extension, and accordingly, in its unmellowed state, the fibres are hampered, and cannot ramble forth to pasture. Besides, admitting that they overcome in part this obstacle in the soil, they must, whenever it hardens in the sun and gapes into chinks, be violently torn asunder, and separated from the stem. The stronger fibres may escape unhurt; but, generally speaking, the finer and more slender filaments must suffer considerably. If clay be so hurtful on the surface, it is almost equally pernicious in the subsoil, from the capacity it has of interrupting the passage of water downwards, and keeping the roots perpetually drenched—an evil no less destructive to the health and vigour of the crop, than the opposite extreme. From its antiseptic power, putrefaction goes on slowly, and the vegetables growing on it are ill supplied with that generous and nutritious food, essential to their perfection and maturity. All its qualities, therefore, are unfriendly to vegetation, except its capacity of absorbing and retaining moisture, and this is of such immense importance as, in some measure, to make atonement for its other defects. When existing by itself, this virtue which it possesses, in so eminent a degree, is useless and unavailing: but when mixed with other materials of a loose and friable nature, it gives tenacity and firmness to the whole, and is highly retentive of the dews and rains which fall to fertilize the soil.

II. Sand or gravel, called sometimes silex, silica, silicious matter, or earth of flints, is distinguished by properties of a totally opposite character, which require to be enumerated that their influence may be distinctly and visibly displayed.

1st. Sand is incapable of retaining water when poured on it, and far less of attracting moisture from the atmosphere.

2d. It powerfully promotes putrefaction, but allows the gases set at liberty to escape.

3d. It has little or no cohesion among its parts, and never binds by the alternations of wet and dry into a compact body.

It will appear from this account of the properties of sand, that it is provided as a corrector of alumine, and that in their effects, the two are destined to counterwork each other. This sort of contrivance in nature is no uncommon occurrence; and while we trace such remote tendencies and bearings, we are struck with the wisdom that fabricated and reared this noble edifice. Inconveniences are obviated by correspondent checks, and this system of balancing all things displays more conspicuously the indications of design, than if there had been no difficulties to overcome, and no evils to remedy. Let us contrast sand and clay in their qualities, that this singular and important truth may be more strongly impressed. Sand suffers water to filter easily; clay is highly retentive; sand promotes putrefaction; clay delays it, but absorbs the gases, which are formed in the decomposition; sand opens an unobstructed path for the extension of the roots; clay gives them firmness in their course, and supplies the moisture which sustains them; in fine, the two may be classed among the contending elements of matter, which, by a union, heighten their common virtues, while their defects are rectified and subdued.

III. Lime, commonly called calcareous earth, enters into the composition of soils.—This is never found naturally in a pure state, but in combination with carbonic acid, for which it has so strong an affinity that it attracts it from the atmosphere. The burning of limestone is undertaken for no other purpose than to expel by heat the carbonic acid, and reduce it to a caustic powder, for the purpose either of building or agriculture, and in this process it loses about the half of its weight. But no sooner is quick-

lime applied to use, and exposed to the atmosphere, than it greedily absorbs, first moisture, and then carbonic acid, and thus either in the ground, or in the new formed wall, it quickly hardens and returns to its original state.

1st. Lime is closer than sand, but much less adhesive than clay. It occupies, therefore, a middle region between the two, free from their imperfections, and blending their common qualities.

2d. It is a powerful promoter of putrefaction, and helps to decompose the animal and vegetable matter, lying in the soil. To this circumstance is owing, in a great measure, its efficacy as a manure.

3d. It has the power of fixing and retaining a very great quantity of carbonic acid, and although it combines chemically with a certain portion, which can only be expelled by red heat; yet the excess can be easily disengaged in a low temperature, and thus tends to nourish the growing crops.

It is not necessary to dilate farther upon the properties of calcareous earth, as, at the first glance, it must be recognized as a highly valuable ingredient; and accordingly, wherever agriculture is carried on with spirit, it is eagerly sought after, though at a high price. This earth exists in immense abundance among the solid strata of our globe, mostly without any foreign mixture, except the acids with which it combines; but occasionally is blended also with the other primitive masses. With carbonic acid, which in a previous letter I particularly described, it forms the most frequent compounds—denominated carbonates of lime—and assumes a variety of names and appearances, and even possesses distinct properties. Spar, marble, stalactites, limestone and chalk are all varieties of this combination. With the sulphuric acid (which is composed of sulphur and oxygen) it forms plaster of paris—a rock well known, as it is profusely scattered by the hand of nature throughout this Province. Lime is, also, found mixed with clay,

and sometimes with sand, and then receives the appellation of marl, and which is valuable precisely in proportion to the quantity of this earth. Sea shells too derive their fertilizing qualities from the lime of which they are composed; and, without descending to farther particulars, it may be safely affirmed, that so necessary is calcareous earth in the composition of soils, that wherever nature has not blended it in their original formation, the agriculturalist should, though at great expense and much trouble, supply the deficiency.

IV. The last earth which has been found in soils, and that too in a much smaller proportion than the other three, is magnesia—a substance, with which every farmer must be acquainted, since it is commonly used as a medicine of the shops. Its properties are nearly analogous to those of lime, and were long supposed to operate in the same way. It has also a strong, though less affinity for carbonic acid, and often forms a constituent principle in limestone rock: but at present agriculturalists are divided about its usefulness as a manure; some of them holding it up as a poison to plants, and others supporting it by an appeal to experiments. It is not worth while to introduce my readers to this dispute; as I am uncertain whether our limestone contains any portion of magnesia; although its presence in the old country, upon accurate investigation, is found to be a very common occurrence. At all events, it is only pernicious when applied in an excessive dose; and this holds equally true with respect to lime, for these two earths should, in all cases, be used sparingly by the skilful cultivator.

By analyzing the various soils and subsoils, they have been found to resolve themselves into one or all of these primitive earths; and their barrenness and fertility have, in no small degree, depended on the mixing and assorting of these ingredients. Loam is by no means a distinct body, possessing in itself appropriate and marked charac-

ters, as many of our farmers, with whom I have conversed, ignorantly suppose; but is a combination of clay, sand or calcareous matter: and as we advance in science, and men among us arise, versed in conducting such investigations, the component parts of our rich intervals and uplands will be ascertained and given to the public. The very diversity, which exists among what are accounted loams, is a decisive proof of what I advance. Some of them we denominate clayey, from the excess of argillaceous matter, others open and light, from the preponderance of sand. In fact, these two original ingredients seem capable of being compounded in such an infinite variety of ways, as to give occasion to that diversified texture of soils met with in all countries and situations; and are contrived to counteract each other's qualities, that by their union, they might furnish the basis of that beautiful and splendid creation of flowers and plants, of shrubs and trees, which decorate the face of nature, and charm us by a sweet assemblage of all that is gay and soft in colouring, with all that is elegant and attractive in design.

Besides these four primitive earths, which constitute equally the soil and subsoil, the upper of these, or the mould as it is sometimes called, contains the putrid relics of organized substances, that have grown and decayed upon it, or have been conveyed thither in the progress of cultivation. The decomposition of these is the proximate cause of fertility; and the richness of soils bears reference to the relative quantities. The residual earth remaining after the process of dissolution, is extremely light in weight, and always of a blackish colour. It is owing to this, that a garden, which has been under long continued culture, approaches to a black tinge, progressively deepening according to the abundance of this matter.

In addition, all soils lying in the territories of an old country, are found to contain various chemical compounds, mineral salts, and metallic oxids; some of which are bene-

ficial, others harmless, and a few injurious to vegetation; and which either pre-existed in the strata, from which the surface has been formed, or have been carried to it by subterraneous springs, or by foreign causes operating in the course of past ages. These chemical bodies are so few in number, so small in quantity, and generally of such unimportant efficacy in vegetation, that it would be preposterous, considering the present state of knowledge, to dilate upon them in these elementary letters. The most frequent are, Epsom and common salt, combinations of potash, lime, and magnesia, with the acids, and the oxid of iron—which is just the rust produced by exposing this metal to the action of the air. It is this oxid, which gives the brown and reddish colour, as well as the intermediate shades, to sand and clays.

It seems plain, that considerable advantages must be derived to the practical farmer from analyzing the different kinds of soils, from comparing the proportion of the earths in the productive, with those found in the barren, from studying the separate effects of these ingredients, and from all these results, deducing the most skilful plan of procedure in effectuating permanent improvements. Chemists of great fame have embarked in this line of research, and vast progress has been made by their elucidations. They have laid down rules to assist and guide the agriculturalist in this department of the arts; they have exemplified the different processes to be performed, and even described the instruments necessary for an elaborate, and accurate analysis.

There is, however, a less laborious and less intricate analysis of soils, defective as our knowledge of chemistry may be, which is placed within our reach, and which may in time lay the foundation of more perfect and accurate methods.

In the field to be examined, take earth a little below the surface, from four separate places, about 1-4 lb. avoirdu-

pois from each. Expose it to the sun, or before the fire, till it is completely dry, and turn it over frequently that it may be well mixed together. From the heap take exactly four ounces, and pass this through a fine sieve, which will allow all the particles of sand and gravel to escape, but hold back stones, small fibrous roots, and decayed wood. Weigh the two parts separately, and take a note of each. The stones and other bulky materials are then to be examined apart from the roots and wood. If they are hard and rough to the touch, and scratch glass easily, they are siliceous or flinty; if they are, without much difficulty, broken to pieces by the fingers, and can be scraped by a knife to powder, they are aluminous or clayey; or if, when put in a wine glass, and common vinegar poured upon them, small air bubbles ascend to the top of the liquid, they are calcareous. The finely divided matter, which ran through the sieve, must next undergo the test of experiment. After being weighed, agitate the whole in water, till the earth be taken up from the bottom and mechanically suspended, adding water till this effect be produced. Allow the mass then to settle for two or three minutes, and in that time the sandy particles shall have all sunk to the bottom. Pour off the water, which will then contain the clay in suspension with the insoluble earth arising from animal and vegetable decomposition. The sand should first be attended to; and if from inspection it be thought either siliceous or calcareous in its nature, the requisite tests may be instantly applied.—By this time the mixture will have deposited at the bottom of the vessel the clay, and other earths, with the insoluble animal and vegetable matter. After pouring off the water, dry the sediment, and apply a strong fire by placing it on the bottom of a pot heated to redness, and the animal and vegetable matter will burn and fly off in aeriform products. The remainder lying in the bottom will be found to consist of clay,—magnesia or lime. To obtain accuracy, another 1-4 lb. of earth should be

taken from the same heap, and the whole process gone over, a second, a third or even a fourth time, that the operator may rectify any blunders he had previously commited, and be satisfied as to the results of his experiment. He should provide himself with a pair of fine scales and a set of weights, divided at least into ounces and drachms. Although vinegar will detect lime by effervescence, it does not dissolve it so effectually as the nitric or muriatic acids; small quantities of which may be procured from the druggists at no great expense. *Acadian Recorder.*

AGRICULTURAL INTELLIGENCE.

The Massachusetts Agricultural Society received in May last, a *keg of Poland wheat* through the instrumentality of Gen. Henry H. Dearborn. They also received a parcel of the same species of grain, through the instrumentality of Amos Binney, Esq.

The Hon. William Gray also transmitted to their care, a "quantity of grain imported from Leghorn, and said to be the seed of that which produces the straws, from which are made the straw hats, so much esteemed in this country."

The society have caused the seeds to be distributed according to the wishes of these gentlemen. The result, when known, will be communicated to the public. From attentions such as these, by public spirited gentlemen, connected with commerce, agriculture must derive great and permanent benefits. Those, who make the Trustees of the Massachusetts Agricultural Society the medium of such attempts to serve the best interests of the country, may rely upon their zealous co-operation in promoting their patriotic purposes.

AN ACT FOR THE ENCOURAGEMENT OF AGRICULTURE AND MANUFACTURES.

SECTION 1. *Be it enacted by the Senate and House of Representatives, in General Court assembled, and by the authority of the same*, That every incorporated agricultural society within this Commonwealth, which shall have raised by subscription of individuals, or which may hereafter raise by such subscription, and put out to interest, on public or private security, the sum of one thousand dollars, as a capital stock, appropriated for the uses of said society, shall be entitled to receive, in the month of October, annually, out of the Treasury of this Commonwealth, the sum of two hundred dollars; and also a proportionable sum, annually, for any greater sum which they should so subscribe and put out to interest, as a capital stock: *Provided, always*, that no agricultural society shall receive, by virtue of this act, within one year, any greater sum than six hundred dollars.

SEC. 2. *Be it further enacted*, That any agricultural society, formed within any county or counties in this Commonwealth, in which no incorporated society at present exists, which shall hereafter be formed, and which shall raise, put out to interest, and appropriate a capital stock, not less than one thousand dollars, for the uses of said society, shall be entitled to receive, on application to this Legislature, an act of incorporation, in usual form, and with customary rights and powers; and also be entitled to take advantage of the privileges hereby secured to the other agricultural societies, on complying with the terms and provisions of this act: *Provided, always*, that no agricultural society, hereafter formed as aforesaid, shall be entitled to the benefits of this act, unless the same be formed in a county, or in an association of counties, including a population of thirty thousand inhabitants.

SEC. 3. *Be it further enacted*, That for the purpose of availing themselves of the advantages of this act, it shall be the duty of every agricultural society, in the month of October, annually, to file in the Secretary's Office of this Commonwealth, a certificate, signed by the President and Treasurer of such society, specifying, under oath, the sum actually subscribed, put out to interest, and appropriated as a capital stock, conformably to the provisions of this act; and the Governor of the Commonwealth is hereby authorized, upon the filing of such certificate, to issue his warrant upon the Treasurer thereof, for the sum to which such agricultural society shall thereupon be entitled, under this act.

SEC. 4. *Be it further enacted*, That it shall be the duty of every incorporated agricultural society, which shall avail themselves of the benefit of this act, to annually offer, by way of premiums, to apply otherwise, at their discretion, for the encouragement or improvement of agriculture or manufactures, a sum equal to the sum annually received out of the Treasury of the Commonwealth, by virtue of this act, and also shall transmit to the Secretary's Office of this Commonwealth, in the month of January, annually, an official statement of their proceedings, in relation to the expenditure of such monies, specifying the nature and objects for which such premiums have been offered, and such encouragement applied, and to whom they were awarded; and accompanying the same with such general observations concerning the state of agriculture and manufactures in the Commonwealth, as they may deem important or useful. And all surplusses of monies, arising from premiums offered, and not obtained, or paid, shall be put out to interest, and added to the capital stock of each agricultural society.

SEC. 5. *Be it further enacted*, That it shall be the duty of every incorporated agricultural society, to offer annually, such premiums and encouragement, for the raising and preserving oaks, and other forest trees, in such

manner, and on such terms, as to their discretion shall seem best adapted to increase and perpetuate an adequate supply of ship timber, within this Commonwealth.

Sec. 6. *Be it further enacted*, That nothing in this act shall be considered to extend to any agricultural society, which has been, or which hereafter may be incorporated in any town, or for any circle of territory less than a county.

Sec. 7. *Be it further enacted*, That this act shall continue in force for five years, and no longer.

[Approved by the Governor, February 20, 1819.]

LIST OF IMPLEMENTS BELONGING TO THE MASSACHUSETTS SOCIETY FOR PROMOTING AGRICULTURE, NOW IN THEIR HALL AT BRIGHTON.

Cooke's Patent Drill and Horse Hoe, for sowing all kinds of grain and turnips, in rows of 9, 12, 18, 24, and 27 inches, and after to hoe the crop. It is considered one of the most important implements in English husbandry. First cost, 18 guineas.

Couch's Grass Rake and scarificator.

Wier's Improved Family Mill, with French burr stones to be used by hand. Cost, 18 guineas.

A Scotch Swing Plough, with chain, draft, and a drill-box, to attach thereto.

An Expanding Hand Hoe, with cast iron mould plates.

A Northumberland Turnip Drill; and may also be used for carrots. An excellent implement in saving labour and seed.

A Breast Hoe for paring sods.

A Northumberland Hoe Plough, with circular coulters and hoes expanding. It much resembles *Sinclair's* Flemish Binot.

An English Plough, presented by ——— Lambert, Esq. of Roxbury.

A Hand Mill for cracking beans, corn, &c.

A Threshing Machine, invented and patented by Elihu Hochkiss, of Brattleborough, Vermont, which obtained the Society's premium in 1818, and of which they have purchased the patent right for the use of this State. Apply to the Corresponding Secretary.

A Straw Cutter, invented and patented by Mr. Hochkiss, which obtained the Society's prize in 1815, and of which they have the patent right for the use of this State.

A Simple Winnowing Machine, invented by John James, 3d.

Two large Spanish Milk Pans, sent to the Trustees by Mr. Barrell, the American consul at Malaga.

CATALOGUE OF BOOKS BELONGING TO THE MASSACHUSETTS AGRICULTURAL SOCIETY'S LIBRARY.

Agriculture, communications to the Board of. Second edition, 1 vol. 4to. London, 1804.

American Husbandry: containing an account of the soil, climate, productions, and agriculture of the British colonies in North America and the West Indies. By an American. Two vols. 8vo. London, 1775.

Anderson, James, Essays relating to agriculture and rural affairs. Fourth edition with additions, 3 vols. 8vo. London, 1797—98.

Anderson, James, Recreations in agriculture, natural history, arts and miscellanous literature, 8vo. London, 1798—1801.

Banister, John, A synopsis of husbandry: being cursory observations in the several branches of rural œconomy, 1 vol. 8vo. London, 1799.

Banks, Sir Joseph, A short account of the cause of the disease in corn, called by farmers the blight, the mildew, and the rust. Second edition, with a letter to Sir J. Banks

on the origin of the blight, &c. By T. A. Knight, 8vo. 39 pages. London, 1806.

Bath and West of England Society for the encouragement of agriculture, arts, manufactures, and commerce; letters and papers on agriculture and planting, &c. Selected from the correspondence of the Society. Thirteen vols. 8vo. 3d wanting. Bath, 1792—1814.

Billingsley, John, General view of the agriculture of the county of Somerset. One vol. 8vo. Bath, 1797.

Blith, Walter, The English improver improved, or the survey of husbandry surveyed; the 3d impression augmented. One vol. 4to. London, 1652.

Bradley, R., A general treatise of husbandry and gardening. Two vols. 8vo. London, 1726.

Buc'hoz, J. P. Histoire des Insectes nuisibles et utiles à l'homme, aux Bestiaux à l'agriculture et aux Arts, 2 vols. 12mo. Paris, 1809.

Chambert, L. Essai sur l'Amelioration des principaux Animaux domestiques, 2 vols. 8vo. Paris, 1815.

Columella, L. Junius Moderatus, of husbandry, in twelve books, and his book concerning trees. Translated into English, with illustrations from Pliny and others, 1 vol. 4to. London, 1745.

Darwin, Erasmus, Phytologia; or the Philosophy of Agriculture and Gardening, &c. 1 vol. 8vo. Dublin, 1800.

Daubenton, Instruction pour les bergers et pour les propriétaires de troupeaux. Third edition, 1 vol. 8vo. Paris, 1809.

Daubenton, M., Advice to shepherds and owners of flocks, on the care and management of sheep, 8vo. Boston, 1810.

Dickson, R. W, Practical agriculture, or a complete system of modern husbandry, with the methods of planting and management of live stock. Two vols. 4to. London, 1805.

Douglas, Robert, General view of the agriculture of Roxburgh and Selkirk. One vol. 8vo. London, 1798.

Duhamel du Monceau, Practical treatise of husbandry. One vol. 4to. London, 1759.

Duhamel du Monceau, Traité d'arbres fruitiers: contenant leur figure, leur description, leur culture, &c. Two vols. 4to. Paris, 1768.

Dundonald, Earl of, A treatise shewing the intimate connexion between agriculture and chemistry. One vol. 4to. London, 1795.

Elkington, Joseph, An account of the most approved mode of draining land, according to the system practised by, with an appendix, &c. drawn up for the consideration of the board of agriculture. By John Johnstone, 1 vol. 4to. Edinburgh, 1797.

Erskine, John Francis, General view of the agriculture of the county of Clackmannan, 4to. Edinburgh, 1795.

Essays, Foreign, on agriculture and arts. One vol. 8vo. London, 1766.

Evelyn, John, Silva, or a discourse of forest trees, with an historical account, &c. of standing groves, with notes. By A. Hunter—a new edition; to which is added the Terra, a philosophical discourse of Earth. Two vols. 4to. York, 1786.

Farmer, the Complete, or general dictionary of husbandry. Folio, 1 vol. London--2 copies.

Farmer's Magazine, The, a periodical work devoted to agriculture and rural affairs. Nine vols. 8vo. Edinburgh, 1802--8.—2d, 4th, and 8th vols. wanting.

Farmer's Calender, The new, or monthly Remembrancer for all kinds of country business, &c. 8vo. Second edition. London, 1801.

Forsyth, William, A treatise on the culture and management of fruit trees, with an introduction and notes. By William Cobbett. One vol. 8vo. New York, 1802.

Gilbert, F. H., Instruction sur les moyens les plus propres à assurer la propagation des Bêtes à laine de race

d'Espagne et la conservation de cette race dans toute sa pureté, nouvelle edit. 8vo. Paris, 1800.

Gilbert, F H., Instruction sur le claveau des Moutons, 8vo.—51 pages.

Hawes' Useful and practical observations on agriculture. One vol. 12mo. London, 1783.

Hill, Thomas, A treatise of fruit trees. Third edition. One vol. 8vo. London, 1768.

Houghton, John, A collection for the improvement of husbandry and trade, revised, corrected, and published with preface, &c. By Richard Bradley, 4 vols. 8vo. London, 1727—8.

Humphreys, David, A discourse on the agriculture of the state of Connecticut, &c. 8vo. New Haven, 1816.

Hunter, A., Geographical essays, 6 vols. 8vo. York, 1803—4.

Knight, T. A., A treatise on the culture of the apple and pear, and manufacture of cider and perry, with an appendix. Fourth edition, 1 vol. 12mo. London, 1813.

Lasteyrie, C. P., Histoire de l'introduction des Moutons a laine fine d'Espagne dans les divers états de L'Europe et au cap de bonne ésperance, 8vo. 1 vol. Paris, 1802.

Lasteyrie, C. P., Traité sur les Bêtes à laine d'Espagne. One vol. 8vo. Paris, 1807.

Lawrence, John, A general treatise on cattle, the ox, the sheep, and the swine. Second edition, 1 vol. 8vo. London, 1809.

Lawson, W., A new orchard and garden, or the best way for planting, grafting, &c. 4to. London, 1676.

Linnæan Society, transactions of the, vols. 4 and 5, 4to. London, 1798.

London, John, on forming country residences, &c. Two vols. 4to. London, 1806.

Lowe, Robert, General view of the agriculture of the county of Nottingham. One vol. 8vo. London, 1798.

Marshall, William, On planting and rural ornaments, 2 vols. 8vo. Second edition. London, 1796.

Marshall, William, The rural economy of the southern counties; and including the culture and management of hops in the district of Maidstone, &c. Two vols. 8vo. London, 1798.

Marshall, William, Minutes, experiments, observations, and general remarks on agriculture, in the southern counties. New edition, with a sketch of the vale of London, &c. Two vols. 8vo. London, 1799.

Markham, G., A way to get wealth: containing six principal vocations or callings. Thirteenth edition corrected and augmented, 1 vol. 4to. London, 1676.

Martyn, Thomas, Flora Rustica: exhibiting accurate figures of such plants as are either useful or injurious in husbandry. One vol. 8vo.

M'Mahon, Bernard, The American gardener's calendar, 8vo. Philadelphia, 1806.

Middleton, John, View of the agriculture of Middlesex. One vol. 8vo. London, 1798.

Michaux, F^s. André, Histoire des arbres forestiers de L'Amérique Septentrionale, with coloured plates. One vol. 4to. Paris, 1810.

Naismith, John, General view of the agriculture of the county of Clydesdale. One vol. 8vo. Glasgow, 1798.

New York, Transactions of the society for the promotion of agriculture, arts, and manufactures, in the state of. Parts 2, 3, and 4. One vol. 4to. Albany, 1794—99.

New York, Transactions of the society for the promotion of useful arts in the state of. Three vols. 8vo. Albany, 1801—14.

Nicol, Walter, The Planter's Kalendar, or the nurseryman's and forester's guide, &c. completed by Edward Sang, 8vo. Edinburgh, 1812.

Ogier, J. A., Mémoire sur l'amélioration des Bêtes a laine, 8vo. Paris, 1802.

Parkinson, John, Paradisus Terrestris. A garden of flowers, &c.; a kitchen garden; an orchard of all sorte of

fruit-bearing trees, &c. with the right of orderinge, planting, and preserving of them and their uses and vertues. London, 1629. One vol. folio.

Parkinson, John, Theatrum botanicum, the theater of plantes, or an universall and compleate Herball. Two vols. folio. London, 1640.

Pearce, William, General view of the agriculture in Berkshire. One vol. 4to. London, 1794.

Philadelphia, Memoirs of the society of, for promoting agriculture, with a statistical account of the Schuylkill permanent bridge. Three vols. 8vo. Philadelphia, 1808, 11, and 14.

Philadelphia, Journal of, Academy of natural sciences of. Vol. I. parts 1 and 2, 8vo. 1817-18.

Pictet, Charles, Faites et observations concernant la race des merinos d'Espagne a laine superfine et les croisemens, 8vo. A Genève, 1802.

Potatoes, Report of the committee of the board of agriculture, appointed to extract information from the county reports and other authorities, concerning the culture and use of potatoes. One vol. 4to. London, 1795.

Rocque, B., A practical treatise on cultivating lucern grass, and some hints relative to burnet and timothy grasses, 8vo. 55 pages. London, 1765.

Sang, Edward, Planter's Kalendar, See Nicol, Walter.

Serres, D'Oliver de, Le théâtre d'agriculture et mesnage des champs, nouvelle edit. 2 vols. 4to. Paris, 1804.

Smith, John, General view of the agriculture of the county of Argyll, 1 vol. 8vo. Edinburgh, 1798.

Somerville, Robert, Outlines of the fifteenth chapter of the proposed general report from the board of agriculture, (on the subject of manures,) 1 vol. 4to. London, 1795.

Stillingfleet, Benjamin, Miscellaneous tracts relating to natural history, husbandry, and physic, and the calendar of Flora. Third edition, 1 vol. 8vo. London, 1775.

Stone, Thomas, A review of the corrected agricultural

survey of Lincolnshire, by Arthur Young. One vol. 8vo. 3d edition. London, 1800.

Suffolk, General view of the agriculture of the county of. One vol. 8vo. London, 1797.

Tracts, Agricultural, &c. 1 vol. 8vo. Containing observations on the cultivation of flax and flax-seed in Scotland, 8vo. 32 pages.—Edinburgh, 1781. Papers and letters on agriculture, by the agricultural society in Canada, 8vo. 34 pages.—Quebec, 1790. A method of preserving grain from smut. Directions for raising of flax after the Flanders method, 12mo. 12 pages. Extracts from the essays of the Dublin society, relating to the culture and manufacture of flax, 8vo. 30 pages. Rules, orders, and premiums of the Bath and West of England society for encouragement of agriculture, arts, &c. 8vo. 164 pages, with an essay on prevention and cure of the hydrophobia, 8vo. 46 pages. Bath, 1799. Treatise on the yellow fever, comprising an account of the disease in the United States, but more particularly as it has prevailed in Boston; by Samuel Brown, 8vo. 112 pages. Boston, 1800.

Tull, Jethro, Horse-hoeing husbandry: or an essay on the principles of vegetation and tillage. Fourth edition corrected, 1 vol. 8vo. London, 1762.

Weston, R., Tracts on practical agriculture and gardening. Second edition, 8vo. London, 1773.

Wildman, Daniel, A treatise on the management of bees. Third edition, 1 vol. 8vo. London, 1778.

Wildman, Daniel, A complete guide for the management of bees. Sixth edition, with plates, 8vo. 48 pages. London, 1802.

Woolridge, J., Systema horti-culturæ; or the art of gardening, in three books. Third edition, 1 vol. 12mo. London, 1688.

Young, Arthur, The farmer's guide in hiring and stocking farms, 2 vols. 8vo. London, 1770.

Young, Arthur, The farmer's tour through the east of England, 4 vols. 8vo. London, 1771.

Young, Arthur, A six months' tour through the north of England, 2d edition, 4 vols. 8vo. London, 1771.

Young, Arthur, The farmer's letters to the people of England, containing the sentiments of a practical husbandman. Third edition, 2 vols. 8vo. London, 1771.

Young, Arthur, Course of experimental agriculture, 4 vols. 8vo. Dublin, 1771.

Young, Arthur, Rural œconomy: or essays on the practical parts of husbandry. Second edition, 1 vol. 8vo. London, 1773.

Young, Arthur, A tour in Ireland: with general observations on the present state of that kingdom, made in 1776, 1777, 1778, 1779. Two vols. 8vo. Dublin, 1780.

Young, Arthur, Travels during the years 1787, '88, and '89, with the view of ascertaining the cultivation, wealth, resources, and national prosperity of the kingdom of France, 2 vols. 8vo. Dublin, 1793.

END OF VOLUME V.